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MADAGASCAR.

BY

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THE ETHNOLOGY OF MADAGASCAR.—The great questions which have puzzled everyone who has thought much about the matter are: Where did the first inhabitants of Madagascar come from? To what race or races do they belong? Undoubtedly the prevalent idea is—and at first sight such would appear the case—that the population of Madagascar consists of a mixture of very opposite races. I shall attempt in this article to examine the *pros* and *cons* of this theory. At the very outset we are confronted with the derivation of the names Madagascar and Malagasy, for it is certain that the Malagasy never called themselves that, nor their country Madagascar. Formerly divided into many tribes, having no political or even commercial relations with each other, they could not possibly have a common term to designate collectively the inhabitants of the whole island. Each tribe had a name the etymology of which gave some insight into its origin, or in many cases only indicated the geographical features or position of its restricted territory. Thus as examples of the latter we have the *Betanimena*, which means "The many inhabiting the red soil," a strip of the east coast. On the northwest coast we have the *Antankarana*, signifying "The inhabitants of the reefs," designating the history of a tribe which at some early period was driven to take refuge on a rocky part of the coast. Other tribes adopted a name the etymology of which is rather political. Thus *Betsimisaraka*, applied to almost all the east coast, signifies "The many who do not separate," or as we might say, "The great Inseparables," pointing to a time when there was a necessity to unite in common defence against some other tribe. So again the *Betsileo*, second only in numbers to the Hovas and occupying the southern central highlands, might be translated "The great Invincibles." The *Hovas*, or,

as properly written, the *Hova* (for Malagasy words take no plural), who are the dominant tribe, and whose country they call *Imerina*, apply to themselves the more pompous political denomination *Ambanitanitra* (the people under heaven); but the origin of the word *Madagascar* is more or less a mystery. The Portuguese and Dutch who first came to the island merely denominated the natives *blacks*. Very ancient authors have called them after Arabs of the coast of Africa, in particular *Bouké*; but this name could only have been local, applying to the west coast natives, for the Arabs knew nothing of the country considered in its entirety. The English in the 17th century never use any other term than *Natives;* but that distinguished and eminent authority on Madagascar, *M. Grandidier*, maintains that it is the French who introduced the general name of *Madagascarins* or *Madagascarois*—a name given in atlases of the 16th century to the island. It must be admitted that we are not much further advanced as to why that name was given or whence derived, but it gradually gave the words *Madécasses*, *Malégasses*, afterwards written *Malégaches* and now *Malgaches*, and the English and native form *Malagasy*.

Hence it is seen that the etymology of the word Malagasy, as well as of the names of the different tribes, gives little or no clue to the ethnology of these peoples. Traditions as to the arrival of them in the island are deplorably incomplete. In a paper written in 1894 by an Englishman long resident in the island, he succeeded in carrying the history of the *Hovas* as far back as 1680, but he gives not the slightest trace of when they first arrived in the interior; and even they found another tribe, the *Vazimba*, which they exterminated, and were themselves divided into bitter factions; nor was it until 1780 they formed a united tribe called *Hova*. However, by dint of studying the types from an anthropological and physical point of view, as well as by examining their manners and customs, religious beliefs, their employments, industries and mode of architecture, and last, but not least of all, their language, much has been done to clear up these questions.

It has now been clearly established, thanks to the scientific researches of M. Grandidier, that we can be certain of three very distinct ethnical groups of immigrants into the island of Madagascar; but it does not follow that either of them was very large, and they alone will not account for the whole population. First, there were the *Andriana* or Nobles of Imerina, who forced their way up to that central plateau, found it peopled by a tribe called the Vazimba, exterminated these latter, and became what are generally

known as the Hova, though I cannot tell from where came the erroneous denomination. The second well-defined group are the *Antaimoro*, occupying the southeast coast, and the third are the *Antalaotra* of the northwest coast. History has now generally established that the first-mentioned group are of Malay origin, driven on to the southeast coast on that very part already occupied by the *Antaimoro*, the second-named group, who nearly exterminated and drove the remnant to take refuge in Imerina. At what period this took place it is difficult to determine; it required some centuries at least in order to enable a small, harassed and detested band to develop more than a million population, shut up in their mountain fastnesses until the close of the last century (1780), when they in turn became the dominant tribe. No one who has seen them can doubt their Mongolian origin, being immigrants from the great Indo-Chinese family. From this, for years and years, writers maintained that the mass of the Malagasy population, who are blacks, must be of African origin. It is so easy to theorize on the subject; Madagascar being so near to the African coast, all the black population must be of African origin! When interested some time ago in the question and confronted with this theory I invariably expressed myself as not satisfied, for the uniformity of the language throughout the whole island demanded an entirely different explanation on the ethnology of Madagascar. How could a small band of Malays, almost exterminated on their arrival on the coast and then driven into the interior, where they lay unknown for centuries, having no communication with the rest of the island, have implanted their language over the whole island? Do not vocabularies, collected by sailors and others on all parts of the coast, long before the Hovas were known to exist in the interior, conclusively prove that there has never been but one language in Madagascar? But such questions were always shelved as irrelevant. The Hovas must be Malays and all the blacks Africans, said the old school; just as if there existed no black Indo-Melanesians who could have come to Madagascar before that particular tribe of *Andriana*, who are the ancestors of the Hovas, as now called. The mixture and crossing of races in Madagascar begets such utter confusion that the error was quite possible. We have Malays, Indo-Melanesians, Makoas, Arabs, Swahili, Indians, and perhaps some Chinese, but to find any one individual of these pure would now be almost impossible; all the Malagasy, or nearly all, are cross-breeds of one kind or another; nevertheless, through all this complex hybridism the fundamental characteristics of the race which from the beginning

formed and ever since has formed the basis of the population on which the other above-mentioned races have been grafted at different periods and in different proportions, and especially the language, on which I lay most stress, must prove that the first immigrants to Madagascar, black though they must have been, point to an Indo-Melanesian origin. It is true that the Oriental negroes, that is, those of Asia and Oceanica, belong to several types, the difference in stature and build being very marked; but there is invariably a uniformity in customs and social development, while their intellectual and moral traits are almost identical. Then, again, these have crossed with Polynesians, producing other types so varied that old writers, basing themselves on certain exterior characteristics, such as the hair and the color of the skin, have attributed to them an African origin.

The same error, quite naturally and more easily, took root as regards the blacks of Madagascar, probably nurtured by the ever predominating fact that Madagascar is so close to Africa and so far from Asia; but a short examination of the matter will immediately throw a different light upon it. The tribes of the coast of Africa were never a sea-faring race, and the currents in the Mozambique Channel are such as to render the passage from Africa to Madagascar exceedingly difficult, whereas the Indo-Malays are renowned navigators and the currents are favorable for descent on the coasts of Madagascar, whether by purpose or accident. Malay junks have on several occasions been met with on the shores of Madagascar, and I am informed that, after the volcanic eruption of Krakatao in 1883, the shores of Tamatave were strewed with pumice stone.

All these facts lead us to conclude without doubt that Madagascar was peopled by *successive immigrations* of Indo-Melanesian negroes long before the arrival of that one particular band of Malays who, by their lighter color and later superior civilization, led former writers into the error that they alone formed *the* Asiatic element, and all the rest, being black, must be Africans. It is also now certain that these earlier successive immigrations brought the language into the country; for, as discussed above, that later tribe, puny and nearly crushed out of existence, could not have implanted its language over an island 900 miles long which it only partly overran during the last 80 years, but which has never had but one language. Then, again, the physical traits, manners and customs of the different Malagasy tribes are not so different as at first sight appears. Now that scientists have been able to eliminate the engrafted elements mentioned above and avoid being misled by the differences of plaiting and doing up the hair existing in

different provinces, which accounts for a seeming difference of features, or by the slight difference in customs consequent upon intermarriage and the nature of the part of the country in which they lived, the conclusion has been reached that great uniformity exists, and that that uniformity declares an Oriental origin. The first immigrations to Madagascar may have been at the time referred to by Baron d'Eckstein in discussing the origin of the negroes of Oceanica, whose dispersion from the Malay Peninsula took place 2,500 years B. C., when fleeing from the Aryan invasion. A part of these, instead of dispersing to the East, may have been carried westward and fallen on the shores of Madagascar.

Finally, having sufficiently shown that the basis of the population of the whole island of Madagascar is Oriental, whatever may have been the date of the very earliest immigration, the question may still be asked: But did not these very first immigrants find the island inhabited by another race, the issue of African immigrants?

M. Grandidier says that in the present state of our knowledge it is impossible to answer this question. If there were aboriginal inhabitants when these Asiatics arrived, they must have been in very small numbers and in a very low state of civilization, for neither in the customs nor in the language of the present Malagasy are any traces of their influence to be found. Words of foreign origin, both African and Arab, abound in the language, but they merely float on the top of the Malayo-Polynesian, as detached names of things, in proportion as these have been introduced in the same manner as English or French words are introduced every day at present; but these do no affect the language. In some parts of the island where fossil bones of extinct animals have been discovered, fragments of pottery have been found which are not the work of the present inhabitants, but probably of some ancient colonies or unknown races which no longer existed even at the time of the very first immigrations from the Malay Peninsula; for these potteries denote a sufficiently advanced state of civilization, and the people who could make such would not be likely to have been absorbed by these new arrivals who came in their junks in disconnected and small numbers, unless these latter could have had time to settle and multiply to such an extent as to exterminate the natives. There is no trace of anything of the kind having happened, and, moreover, it is difficult to conceive the total disappearance of an already civilized people. The most that could happen would be their reduction to slavery, and in that case they would have left their impress on the customs and language of the conquerors.

To sum up the argument of this paper, it is well established to-

day that the people of Madagascar are one, in the sense that they are all of Asiatic origin, but consisting of successive immigrations dating very far back; that the Hovas are comparatively a later immigration, and only one of many others; that the African element claims no more title to a basis of any part of the population than the other floating foreign elements that have been engrafted on the main trunk without materially affecting the uniformity of the customs, manners and language of the whole country.

There is still much to be learnt from an anthropological and ethnographical point of view; but it is now generally admitted that, thanks to such scientists as Grandidier, the notions we possess on the origin of the Malagasy are sound and have dispersed the false ones so long existing.

In the foregoing paper I have developed what are now the generally scientifically approved theories of the ethnology of the Malagasy people. As a fact we know more of the people than of their country. The natives of a country, still wild and unknown, come down little by little to the sparse European settlements; but before the Europeans in their turn can visit any considerable part of the island two things are primarily indispensable: some geographical knowledge of the country and means of communication or conveyance. I will not speak here of the difficulties arising from an insidious climate or the occasional hostility of natives, which, though not insuperable, have nevertheless much retarded scientific research in many parts, especially the west coast of Madagascar; but communication is almost lacking and the geography of Madagascar has hitherto been the most imperfect of any country in the world of similar dimensions and importance. The earliest maps of Madagascar are ludicrous in the extreme, and the contour of the island has been gradually determined by marine observations, while the interior geographical exploration, as long as the island was under native rule, was left to missionary travels or occasional naturalists and private scientific explorers, who often fell victims to the climate or to the cupidity of the natives, who robbed and stripped them of their instruments and sometimes took their lives. In any case, meritorious as was their work, it was disconnected and imperfect as a whole and consisted merely of a broad network of routes through the island, with little or no knowledge of what lay between them. Moreover, as is explained later on, it is impossible in such a mountainous country to obtain a survey merely by traversing the island with the aid of the compass. Nothing but a trigonometrical survey of such a vast territory could satisfactorily attain that object,

and this, to be effectual, must naturally have had to be under one supreme control, embracing the whole island. It is gratifying to see that, whatever be the qualities of the French for colonization, they have taken in hand seriously this work, and Madagascar is likely to be shortly known to the scientific world under many new aspects. In order to draw your readers' attention to this undoubted advance in the path of science I have culled from the latest reports of the sittings of the Academy of Science in Paris such remarks and data as I think will be new to American readers, with some references to the latest works and cartographical productions relating to the island of Madagascar from a geographical point of view.

On the Geography and Cartography of Madagascar as developed between 1897 and 1899.—General Gallieni, who is now in France after having exercised for two years and eight months the distinguished functions of Governor General of Madagascar, was not merely occupied in pacifying and organizing this new colony, which he found in a complete state of anarchy and rebellion, and where in a very short time by his firm and intelligent administration he arrived at really extraordinary results. It is known to all the world that at the outset of his brilliant career he was one of the first explorers of the Western Soudan, and that his long stay at Segou-Sikoro was as valuable to geography and ethnography as to the expansion of French influence. More than ever convinced after his long campaigns in the French colonies in Asia and Africa that science alone can advantageously open the way to colonial enterprise, as soon as he arrived in Madagascar he immediately organized a methodical and systematic exploration of the different provinces, so as to make us acquainted with them from all points of view, and to furnish us as completely and as quickly as possible with the details of their resources.

Consequently, his first efforts were directed to the issuing of a map of Madagascar, which in 1896 was scarcely in embryo. An exact, correct and detailed map is, in fact, the indispensable basis of any serious study of a country, as well as of all scientific research and exploration.

Before the conquest of the island by the French the central province had been triangulated and drawn with care, but the rest of the country had only been crossed by a few travellers, whose want of exactitude left much to be desired, and whose routes even then circumscribed enormous tracks of unexplored territory. On the 1st of November, 1896, the General reorganized on a new basis, with the aid of his Chief-of-Staff Lieut.-Colonel Gérard, the geo-

graphical service of Madagascar, which had been established at Tananarivo a few months previously, and which has become one of the offices of the staff under the title of Topographical Office. This office is intrusted at the same time with the triangulation of the great island and with a definite map, as well as with the production of photographs, engravings or lithographs likely to be serviceable for a better acquaintance with the colony under its different ethnographical aspects, its botanical resources, and its agricultural and mining prospects. It has been under the able direction for two years of Captain Mérienne-Lucas of the Infantry Marine, who has drawn up a considerable number of maps, which have been forwarded to the French Institute.*

A manuscript memorandum of 40 folio pages, accompanied by a map, scale $\frac{1}{1000000}$, also in manuscript, giving the actual state of the triangulation of the first degree of Madagascar, as well as plates containing the geographical co-ordinates of all triangles measured by the Reverend Fathers Roblet and Colin and the geodetic officers, both of which have been forwarded to the library of the French Institute, contains most valuable and interesting information on the work hitherto carried out and the results obtained.

The following will give some idea of the plan of the work:

The system of projection adopted for the production of the map is the same as that employed by the War Office, that is to say, Flamsteed's projection, modified by Colonel Bonne, which admirably suits the island of Madagascar on account of its elongated form in the same line as the meridian. The development is effected on the 47th degree East longitude and the 21st degree of South latitude—these two axes passing pretty nearly through the centre of the island. Contrary to the case with maps of France, the concavity of the meridians and parallels of longitude and latitude is naturally turned towards the South Pole. The scales on which the sections of the map are drawn up differ according to the value and number of documents in the hands of the Topographical Office: for the central and eastern regions and for Diego Suarez the scale is $\frac{1}{100000}$, but for the rest of the island, as yet little known, we have to be content with a contemporary map on a scale of $\frac{1}{300000}$, which comprises 32 sheets of 35 x 33 centimetres, while the map on a scale of $\frac{1}{100000}$ will entail 508 sheets, each representing a surface of 48 x 30 kilometres, or about 560 square miles.

* Twelve sheets of the map, scale $\frac{1}{100000}$ (Tiakoderaina, Anjozorobe, Ambohidrabiby, Analabe, Lake Itasy, Antananarivo, Moramanga, Soavinandriana, Ramainandro, Andramasina, Beparasy); three sheets of the map, scale $\frac{1}{300000}$ (Ankavandra, Morondava, Soavinandriana); and one general map of Madagascar, scale $\frac{1}{2500000}$.

In a country like Madagascar, where by reason of the geological formation of the soil, the incessant variations of the angle of declension in points quite near in latitude, where even sometimes in the same spot they reach 4 degrees, the working of the plans and itineraries by means of the compass carried on by some of the explorers for the construction of the map became a sheer impossibility, it was indispensably necessary to complete and rectify by a thorough triangulation the series of co-ordinates hitherto known.

During the march of the French army in 1895 Captains Bourgeois and Peyrouel had connected Majunga with Andriba. From 1897 geodetic chains were extended following the two axes of the island, and the telegraph line from Tamatave to Antananarivo and thence to Majunga gave the opportunity of exactly determining the longitudes and placing the astronomical points.

During the same year the Reverend Father Colin extended the triangulation of Imerina as far as Andriba, and continued it to the east to join with the work being carried on by the topographical brigades between Ambatondrazaka, Tamatave and Andovoranto, which took for a basis a line parallel to the sea, which was measured three times by two different groups of observers, near Ankarefo, with a steel tape. These three measurements gave the following differences over and above the mean length of 5082.13 metres: the first measurement $+0.^{m}26$; the second measurement $-0.^{m}25$; the third measurement $+0.^{m}08$.

In 1898 the network was pushed on from Ambatondrazaka to Antananarivo; the side Antananarivo-Lohavohitra, calculated on the base line of Ankarefo, has a length of 41,312 metres, and by the base line of Ialamalaza 41,311 metres, that is to say, a difference of about one yard, which is very satisfactory.

The Reverend Father Colin in 1898 explored the west, and corrected a great many astronomical positions.

As to the topographical brigades, they have thrown a network of triangles along the south, following the long axis of Madagascar, from Fianarantsoa to Fort Dauphin, with a transverse axis running northeast and southwest from Ihosy to Tulléar. This section of the triangulation is effected on two base lines, the one temporary, measured near Fort Dauphin, the other 9,537.71 metres long, measured in the Horombe district, where the necessary observations of latitude and of the azimuth have been taken. The values of the logarithms on the Antananarivo-Lohavohitra side, calculated on the length of the Horombe base and the chain south of Antananarivo, are identical to the sixth decimal point with the results arrived at by starting from the Ankarefo base. At Fort

Dauphin verification is effected up to four decimal points with the logarithms of the temporary base.

During the year 1899 the programme laid down for the geodetical brigades consisted in connecting the district of Ambatondrazaka with Diego Suarez. There is also the question of completing the triangulation, started in 1892 by the Revd. Father Colin, between Antananarivo and Andovoranto, and elucidating the question of the touch with Andriba by the triangulations of the Rev. Father Colin and the expeditionary corps of 1895, which show a discrepancy of 12 miles of longitude.

The skeleton work of the triangulation of Madagascar is therefore shortly about to be completed on these broad lines. The perseverance and skill displayed by the officers intrusted by General Gallieni with this important and difficult work have been crowned with success. In less than three years they have measured a chain of triangles, the development of which covers 850 miles and upwards. It must be said that this work was first commenced scientifically by the Jesuit Fathers Roblet and Colin; but great credit is due to General Gallieni's staff, particularly to Captains Gros, Durand, Dumézil, Lallemand, Maire, Vallet-Prévost, Hellot, and to Lieut. Maritz.

We may hope, then, shortly to be provided with a complete map of Madagascar, which hitherto has undoubtedly been the most backward country in the world for the accuracy of its cartography.

The latest corrections made to the former co-ordinates of some of the principal points in Madagascar cause a very notable change in the outline of the southeast and west coasts of Madagascar. I append the principal ones, with the differences between the old and new.

POINTS.	LATITUDE S.	LONGITUDE E.	DIFFERENCES	
			LATITUDE.	LONGITUDE.
Tamatave (R. C. church tower)	18° 9′ 28″.4	47° 3′ 39″.1	−0′ 7″.5	− 1′ 35″.9
Andovoranto (northwest angle gov't house)	18° 57′ 32″	46° 44′ 29″.6	−0′ 28″	− 2′ 46″
Fort Dauphin	25° 1′ 51″.6	44° 38′ 26″.2	−0′ 3″.7	−11′ 19″.5
Mevatanana (flag-staff)		44° 27′ 49″		− 3′ 11″
Majunga	15° 43′ 24″.2	43° 56′ 36″		− 1′ 59″
Tamboharano	17° 30′ 3″	41° 47′ 46″		+11′ 31″
Maintirano	18° 9′ 54″	41° 42′ 45″	+0′ 44″	− 0′ 5″
Benjavilo	18° 59′ 57″	41° 53′ 0″	−3′ 48″	− 0′ 55″
Tsimandrafoza	19° 47′ 30″	42° 4′ 30″	−0′ 10″	− 3′ 45″
Morondava	20° 17′ 21″	41° 56′ 45″	−0′ 54″	+ 0′ 30″

NOTE.—The longitude is calculated from the meridian of Paris.

While the officers of the Geodetic Department have been pursuing their labors of triangulation, into which I have attempted to give an insight, others have made a topographical plan, on the one part of the region between Tamatave and Ambatondrazaka, and on the other between Tamatave and Andovoranto. The topographical office has now collected and condensed the numerous plates of Father Roblet, and has completed them by the aid of the discoveries of Lieutenants Rocheron and Cointet in the district of Ankavandra; of Lieut. Maritz between Andriba and Vohilena, and between the rivers Ikopa, Betsiboka and Mahajamba, and to the west of Betafo. Others have perfected plans, not only of the east and north of Antananarivo, but also of the Sakalava country, and documents are now forthcoming to permit of the publication of a serious map of these regions on the scale of $\frac{1}{500000}$.

Scientific missions connected with the army of occupation have, moreover, overrun the country in all directions. I might specially mention those from Antananarivo to Diego Suarez, and from Tsaratanana to Nossi-Bé, and the Mangotsy river, which have been rich in results of all kinds—geographical, ethnological, meteorological, zoological, botanical, geological and agricultural.

These results are condensed in a very useful and instructive monthly publication printed in Antananarivo, entitled "*Notes, Reconnaissances et Explorations*," two volumes of which appeared in 1897 and two in 1898. These volumes contain no less than 1,600 pages and 100 maps or plans made in Madagascar, and I recommend them to your readers for the most scientific treatise on the present geographical development of Madagascar.

The Immigrant's Guide to Madagascar (*Guide de l'immigrant à Madagascar*), 3 vols. in 8, with atlas and 24 maps, gives a very detailed description of the island under every heading: history, geography, organization, industry, commerce, agriculture, colonization, etc., and shows how much has been done during the last two years.

THE HEATHS AND HOLLOWS OF HOLLAND.

BY

WM. ELLIOT GRIFFIS, L.H.D.

Holland is often compared to a ship, and all English-speaking people of culture are familiar with the satiric verses of Andrew Marvell, in which this idea is suggested and elaborated. The country draws many feet of water, and one goes on board of it and down in the hold to get at its cargo. As the original ship had no deck, but was first hollowed out, and then, as its evolution proceeded, was built of various parts riveted or nailed together, with floors and compartments, with powers of offence and defence, until we behold to-day the ocean liner and the battleship, so in the growth of the Dutchman's land we trace an evolution almost as wonderful.

This shall be our story this evening: to show by history and geography what kind of a country Queen Wilhelmina's kingdom is —like a ship amphibious, partly in and out of the flood, both dry and wet, surrounded by waters, yet not an island. We shall find that in the midst of the liquid element nature laid something like a keel of hard land, and that by and by man put on the ribs and planks, nailing them together into habitable hollows, yet affording inclosure from the waters and making even a cozy home. In time decks and compartments, with floors and varying levels, were added. Then, when pumps and windmills were erected to keep the hold dry, it looked as though the ship was equipped with masts and sails. When defence was necessary against their ever active enemies, the floods and storms and currents, we see men making their walls thicker, riveting them with piles and buttressing them with piers, jetties and ripraps. Still further, as the nautical man must not only keep his timbers free from barnacles, but also guard against the teredo, or tiny worm, that would honeycomb their substance, so the Netherlanders had to sheathe their land with masses of stone that have almost cost their weight in copper. With new and added dangers from without, the science of defence developed also. The land was armored, and with new possibilities of resistance maintained its life in a higher organization. So to-day we see the miracle of geography—a hollow land in which, as in a ship, the chief wealth of the country is stored down below the

level of the sea, while the windmills and lofty church spires that dominate the landscape complete the wonder. Hence we are not surprised in this country, so nautically constructed and built up, foot by foot and yard by yard, to be saluted with the question as a morning salutation, "How do you sail?"

Furthermore, as vigilance is the first virtue and discipline the prime necessity on board a ship, so here we find these maintained in the Netherlands at a high standard. Other nations have but one state—the political structure and sovereignty, but the Netherlands have two states—politics and water. Yet this duarchy is not, as in the case of old Japan and Siam, personal. There is no Mikado and Shōgun, but the Sovereign State and the Water State. Of the former, democratic monarchy as it is, Queen Wilhelmina is the lovely figure-head. In the latter is comprised the general staff of inspectors, engineers, watchmen and commissaries who superintend the great army of toll collectors, sluice, bridge, gate keepers and workmen skilful with the spades, drills, pumps, piles and the machinery driven by steam and wind. This department, which has charge of the preservation of the country from liquid danger, is the chief division in the Ministry of the Water State, Trade, and Commerce.

Or, if we change the figure descriptive of the evolution of the Netherlands as a growth under human direction, we may say that man by his industry, courage, tenacity and faith has transformed a mud-hole into a garden. Indeed, the Dutch in their proverbs rather seem to intimate that God Almighty had only a subordinate part in the making of their country, and that all the glory belongs to man himself. It is thus asserted, with more wit, rhetoric or poetical fervor than with truth (as in the dictum, "God made the sea, but we made the land"), that the Netherlands have been wholly created through human genius and industry; but this, as geologists and engineers know fully, is not true. We must allow nature and the Power that wears physical laws and matter as a garment some credit for the creation of Holland, and in outlining the story we shall look first to times before the advent of man.

Geologists tell us that the western part of the Netherlands was once an inland sea. The English Channel was not then, as now, open, but closed. The inflowing rivers, Scheldt, Maas, Rhine, Ems, Weser, Elbe, brought down from the interior of the continent strata upon strata of gravel and matter in suspension, laying deposits in the shallow basin. It is possible to trace the boundary of this sea, and even learn its depth, by noting the lines of fossil

shells. These are found fifteen to twenty feet deep below the level of the ordinary high tide. This sea bottom was deposited upon older diluvial or drift beds. Three distinct æons are noted by the geologist, but that process most interesting and important for Holland's future history was the deposit of the fertile "sea clay" making the three maritime provinces of Zealand and the two Hollands. When the limestone rock which once united Calais and Dover at last gave way, this life-giving substance was still more abundantly deposited over the sandy bottoms. It is this sea clay, as it is called, which makes the soil of Zealand perhaps the richest in all Europe and which gives Zealand and the two Hollands their preponderant agricultural wealth above the other eight provinces.

To-day, looking at the map, we find the fruits of the endless war of wind and wave in the sand dunes. The crescent of islands northward from Friesland and Groningen are the remains of old lines of dunes. Those lining the coast are the bulwarks of the country. Behind these dunes and the gaps or embrasures in them, now closed by dykes, we find low meadows rich in sea clay, and, further back, heaths, sand hills and diluvial strata which are sufficiently above the level of the sea to remain dry. The dunes, though high enough sometimes to be called hills (the average altitude being sixty feet, some rising even to two hundred feet), do not by any means suggest the Rock of Ages or the everlasting hills, or that immovableness which we associate with elevations in nature. On the contrary, the dunes are but heaps of unstable material and have a tendency to move eastward or to drift off on the landward side. This arises partly from the tremendous velocity of the channel current and partly from the strong west winds. At one place, Loosduinen, the old moor or fenland which once formed behind the dunes, can now be found outside of them, overlaid and packed in the sand. The most remarkable proof of the march of the dunes eastward is in the Roman camp at Brittenburg, or Huis te Britten, west of Leyden, which was built in the early Christian centuries inside the dunes. When the Roman legions departed southward, the camp was overwhelmed by hills of sand. After a thousand years of burial it emerged to resurrection, yet was not visible on land but in the water. In 1694 its lines were discerned sixteen hundred paces out to sea. Relatively this fine ruin has been traveling ever since, while the dunes still tumble inward. Furthermore, Katwijk, Domberg, Scheveningen, Egmond and other sea-coast villages have been frequently removed further inland. In our days the Dutch assist in the making of new dunes, carrying by ship or

rail vast quantities of the sand from these wind-formed hills for defences in other places against the seas. Netherland is a country whose soil can never be still, but must ever be kneaded and rearranged; yet not a shovelful is wasted, for it cannot be spared.

To-day the Netherlands are protected by nearly sixteen hundred miles of sea dikes and a still larger number of miles of river dikes. Ninety lakes have been drained. By dikes and pumps the Dutch more than doubled the original area of their country as first known in historic times, and they support a population nearly eight times as great as when they first took up arms against Philip of Spain for independence. Their political history, glorious as we read it in the prose epic of Motley, and honorable, in that Holland has been the teacher of nations and the benefactor of the world, has for its most shining chapter that of rescue and defence from water of the richest little country on earth and the demonstration of man's lordship over the elements. To appreciate the achievement, let us glance at it chronologically.

When man first appears upon the scene he was a hunter or fisherman who lived on the German slope, the dunes, or the higher ground deposited in time of flood. A few feet or inches below him were the fenlands, rich in undergrowth and populous with animal life in fin, feather and fur, amid which rose great forests where were numberless pools and lakes. In the sea clay land were here and there dry spaces upon which his tamed animals could graze, and during dry seasons he could take his cattle and pasture them there. By and by, as he became more venturesome and learned how fertile were these beds of sea clay, he cultivated the soil and stored up food for winter. He brought clay from the space around his hut, gradually elevating its foundations a few feet above the surrounding waters, in time making his mound habitable even in time of flood. As men associated together in enterprise and labor, there appeared upon the landscape the *terpen*, or artificial mounds of larger size, which the traveller notes on the landscape of Friesland, Groningen and Zealand. These, in the evolution of history, became the bases of towns and villages, the Groote Kerk standing in the middle. Or, the original *terp*, if unbuilt upon, was made the burg or fortress, as in Leyden. Linguistically the word is related to *dorp* or *dorf*, meaning village. To-day the archæologist finds in excavating these terpen a number of strata representing the various eras of civilization. At the top are the modern buttons, bits of crockery and wastage of picnic parties. Further below, the rake or spade gathers up mediæval images, coins, crosses and relics.

Still further down are the tools, jewelry and personal possessions of the mediæval Frisians, Angles, Saxons and other tribes. Next in revelation are the images of Mars and Venus and things of Roman use and ornament, of war and of peace. Last of all we find the stone combs and bone needles of primitive man. Modern science also shows these terpen to be rich in animal deposits, and, being composed of these and the prized sea clay, the substance of terpen when cut down and carted away is sold for so much a ton as a rich top dressing for sandy land, yielding in some cases a small fortune to the owner.

Further back from the sea clay lands of the coast and sloping upward toward Germany are the sand hills; and in North Brabant, Guelderland, Overijssel and Drenthe are vast heaths of this infertile substance. Large parts of North Brabant have only stains or patches of vegetation, with not a little morass, the fertile portions in the sea deserts being oases of clay soil. Every one knows of Batavia and the Batavians, whose name comes from the Betuwe, that is, the better or the good land or island, well watered, rich in river alluvium and sea clay and known from the dawn of history to be fertile. North of the Betuwe, in Guelderland, is a great Veluwe or vile land, a perfect wilderness of sand, which it is hopeless to try to cultivate or fertilize. This barren "island," stretching between Arnheim and Zwolle, the Rhine and the Zuyder Zee, is traversed from east to west by a railway, and right in the western centre is Het Loo, the palace of Dutch royalty. Similar sterile plains, or rolling land, unstable as water, and never excelling, are found in Overijssel, while Drenthe is nearly all sand. Yet, at Coevorden, which means Oxford or Bosporus, between the two areas of sterility and hopelessness—that is, hopeless to anybody but a Dutchman, for he is now busy in draining and reclaiming them—the great Bourtanger morass and the Drenthe barrens, a strip of hard ground forms the gateway into and from Germany. In Roman and in all other times, since "geography is half of war," Coevorden has been a defensive frontier fortress; while again, to illustrate the truth that, in these Low Countries, sand is death and clay is life, only a few miles away from Coevorden are the green fields of Dalen, with their pretty houses and sleek cattle. And this because here is a dot of clay soil.

It is in Drenthe, perhaps contemporaneous with the terpen, that we find the first structures raised by men, who may have been the Cimbrian Celts. With their rude levers and rollers they gathered together into semblance of order the boulders brought down by

Scandinavian glaciers in the Ice Age, rearing edifices which whether they are tombs or altars the learned are not yet agreed. Tradition, as rich as moss on the unrolling stone, names these Hunebedden or giants' graves. On the soil of Drenthe there are about sixty of these groups of boulders, the most striking being at Rolde and Zuidlaren.

While the five maritime provinces of the Low Countries illustrate the hollows, the six inland provinces illustrate the heaths. To the artist and to the lover of the picturesque in nature the charms of the heaths are as great as are the hollows to the engineer and student of civilization. The wild flowers that win their life where there is moisture, the inconspicuous blooms and the lower types of vegetable life in the peat beds and turf, furnish marvellous effects in color and beauty. At sunrise and sunset, especially when the prismatic tints of the dew pierced by the sun's rays add their reinforcement of color, there seems to be a gloss of glory that makes these heaths like the Field of the Cloth of Gold. In the marked alterations of tint and hue caused by slanting sun rays and varying measures of sunlight there are effects which are to the eye what sweet music is to the ear. I can testify to many pleasant hours spent in these solitudes. Certain it is that artists from all parts of Europe come hither to feast their vision and take delight in these lonely places.

When the first light of history falls upon heath and hollow in the Low Countries, we find that the rude engineering of the people whom the Romans found in the land has been supplemented by the work of masterful men, who needed camps and military roads and improved water communication to hold the people whom they had conquered true to their allegiance. Their works, with spade, hammer and trowel, are mostly associated in local tradition with Drusus and Corbulo, but no one can say exactly where the grachts or canals cut by them are now located. Not a few places in the Netherlands bear names that are but modifications of the original Latin, or Latinized Keltic or Teutonic words, such as Vianen, or Fanum Dianae, Nymegen or Novio Magnum, Doesburg or Drusus Burg, Leyden or Lugdunum, etc. Other things borrowed from the Romans, either during their occupation or later, are seen in the terminations or the words meaning canal, street, port or gate, wijk (from vicus), etc.

During five centuries, the Frisian terp, the Teutonic mark and the Roman farm, camp or villa adjoined. While with temples and altars there were towers, fortifications, camps, roads and canals,

yet the Netherlands resembled for the most part a frontier region, the lowest and the most watery in the Empire. Whatever the Roman's impress may have been upon the landscape, his works were not only given to neglect or destruction by the overstreaming of the nations from the North and West, but were overwhelmed with the wind-driven sand or the overflowing sea and river. This new top dressing of humanity under Christianity brought in the Middle Ages, or that period between the Roman engineering and civilization and the rise of brickmaking and the building of dikes and dams.

From the sixth to the eleventh century very little was done to change the general surface of the land, though much improvement was secured in favored places. It is interesting to glance at a mediæval map in order to see how great have been the triumphs of man, the lord of the soil, in the seventeenth and especially in our own century. Walcheren in Zealand, now a single island, was once a dozen islets. Much of what is now South Holland was under water, and in what is now the province of North Holland, where are to-day shining green fields rich in cattle, was a network of pools, lakes and broad, sluggish streams and lagoons. Zealand had more islands in it than it has to-day. It is further interesting to note where were the towns, villages and churches, showing that here, at least, were the points of hard lands where human beings could live socially together. We may imagine the whole country as a great flat delta formed by the deposits of the continental rivers. For the most part, certainly along the coast and in the southern river district, were hollows or bowls filled with water, both salt and fresh, with here and there little islands standing out on which were towns and villages. On the western side, toward Germany, were great sandy deserts, and vast, gloomy morasses. Between the two sections of heath and as yet undrained hollows spread the Lake Flevo, of Roman name. All the rivers, or streams with currents, flowed from east to west, except one which joined the waters of the Rhine to those of Ijssel. All the time the shape of the country was being altered by the ceaseless action of the water, in storm and flood, wind and current, rain and tide. In the thirteenth century, by a great influx of the sea, eastern and western Friesland were separated and the Zuider Zee was formed, making secular differences in manners, customs and language. To-day, after six centuries, the Dutch have decided to drain the land and drive out the intruder. The twentieth century will see the work done.

With the new movements of society, caused largely by the Cru-

sades, with the stimulus to intellect, inventions, manufactures and commerce given by the meeting of nations and contact with the rich East, we find toward the twelfth century serious efforts made to keep out the waters of sea and river, to extend the area of arable and pasture land—in a word, a beginning towards the making of the country as it is to-day. The introduction of the windmill was a powerful factor in attaining this through the saving of human labor. From being a rigid and immovable structure, always facing one way, it has been so modified by the Hollanders that by means of a movable cap and windlass the sails may be set to face any wind, and the sails on the spars or arms may be furled or spread at pleasure. The windmill is now of manifold assistance to men, for it can pump, grind, hoist, lower, work the screw or the scoop wheel and serve as storehouse or dwelling.

The building of barriers against the sea began in earnest after the twelfth century. For the first time we note upon the map the names of places ending in "dam" and later those ending in the name dike. There is a distinction, with something like a real difference, between the two terms. The dam is usually the protection of one farm, village, castle or town; it may be circular or square, an enclosure of some sort. A dike is a dam, but it is longer, and often stretches from one town to another, or it fills the whole gap between the separate dunes or encloses a whole island or many islets, making one unit of hard land. Again, it is the backbone of a whole district of country. So also between "gracht" and "canal" we discriminate. We find a gracht a moat, a private or municipal ditch. A canal is a waterway, a national or provincial highroad, connecting cities of sea and river, and usually many leagues long.

By the fifteenth century it was borne upon the minds of the Dutch people, stimulated by good rulers, the idea that their country might be greatly enlarged and enriched by unity of effort. To use their own mottos, "Eendracht maagt macht," unity makes strength, and "Concordiā parvæ res magnæ crescunt," by concord little things become great. They have not yet reached the determination to reclaim land on a large scale, or come to the making of polders by pumping, but there are being invented the tools which are to do the work. Well says Marvell:

> "Among the blind the one-eyed blinkard reigns,
> So rules among the drowned he that drains;
> To make a bank was a great plot of state,
> Invent a shovel, and be a magistrate."

Either by original invention, or by adoption and adaptation, we behold in the Netherlands above every land in Europe rapid evolu-

tion of brick and tile making, the plough, pile driver, pump, windmill, drill, stove, dredge, mud scow, submarine mattress, canal locks, and ship's camel, with new methods of diking and general improvement in hydraulic and hydrostatic science. The distinction is made between the outer waters of sea and rivers and the inner waters caused by rainfall, especially in the peat pits. The unstable land is riveted together by piles, and whole forests are imported and planted head downward, the people living on top of timber that was once nearest to the roots. In Dutch architecture the piles are as the men, giving solidity; the superstructure as the woman, making grace and beauty. But if the houses are to their piles underneath what wives are to their husbands, they thrive or suffer according as the former are steady and keep their position or sway and lose equilibrium. Do women lose grace and charm according as their supports are deranged? So do the Dutch houses. They have to be held together with rods and shores, or laced with braces and anchors, so that we often see in old Dutch houses what suggests stays or corset, or an iron frame such as we now build of steel inside houses, before putting on the outward clothing of brick or stone. Think of the mighty forests buried head downward in the soil of Holland, the billions of trees and poles driven in to pin and hold things together! Sometimes it costs more, not to lay but to drive a foundation, than to build a house, more for the under than the superstructure. As a rule, cellars are not known in maritime Holland, though basements, with their tiled walls and well-cemented floors, are common.

In the work of defending the country with dikes, the monasteries often took part at first, paying the expenses or eking out funds secured by taxes. The stadholders or king's lieutenants often made noble names for themselves in rousing public spirit to wall with turf and timber the hollow land against storms and floods. About the sixteenth century began also the building of jetties to strengthen the dikes in resisting the ocean. It was probably not, however, until the seventeenth century that the work of draining the lakes and wresting land from the sea by means of dikes and pumping was seriously or systematically undertaken. In North Holland, however, with funds provided by stock companies, led by Usselincx, that made their money by selling off the land recovered to cultivation, or by utilizing the booty fished up by Dutch divers from the Spanish ships, the work of making large polders was inaugurated on a large scale and has continued during three centuries. Where was once lake and morass we have now farms, villages and

towns, and cows feed where the fishes once did. So rapidly in some cases was the work done that the town arms represent the mermaids as being surprised and put to great inconvenience by the sudden change in their element. Waking up from their naps, they vainly try to get out to sea through the sluice gates. To-day the great Beemster polders create, in discerning tourists, the highest admiration.

The cutting of canals and means of communication between town and city, facilitating inland commerce, went on apace, while the digging of turf for fuel became a national industry. The riches brought to the Netherlands by foreign commerce were utilized to reclaim and enrich the native land of the explorers, whose flags were mirrored on every sea of the world. Yet, while the ships from the Orient brought back spices and gold, and many rare and precious treasures, they also imported one execrated though tiny immigrant, and for awhile the boldest people in Europe felt like a lion with a gnat stinging his nostril. This enemy, no bigger than a pin-head when it begins business and earns a living for itself, caused as great a revolution in the making of dikes and dams as gunpowder had caused in the equipment of the soldier. Yet, whereas the steel-clad knight had perforce to doff his panoply and be content with cloth, the Dutchman had to change his dikes from wood to stone. The new and dreaded intruder was the teredo, a tiny worm which needs only the space of a pin-head for its days of babyhood, but which soon grows to be inches in length, and for activity and effectiveness can give points of profit to the steam rock drill and diamond perforator. The little creature bears no malice to man, but, in search of his food only, he perforates and cuts long tunnels in the hardest wood, quickly honeycombing and destroying keel, stanchions, ribs and planks. Using the salt water as a lubricant, he works his stony head like a universal ball joint-bearing file, drills and reamers and renders useless the toughest defences which the forest can furnish. The solid beams and piles set for the defence of the Low Countries, bolted together as they were with iron, were found to be eaten through and through. When the Dutch people discovered this state of affairs along the coast they were more frightened than when the hosts of Alva or Louis XIV. invaded their soil and beleaguered their cities. So after fasting and prayer before God they rose up to work. Whereas the old material for the making of dikes was of earth and turf faced with wood or osier work, and only occasionally of brick, especially in the city canals, it was now necessary to seek in Scandinavia and Germany for a new suit of armor. They imported whole fleet-loads

of Norway stone, basalt and granite, with limestone from Belgium and many varieties of teredo-proof rock from Germany. They also learned to improve the form of the dikes, so sloping them at the correct angle that the force of the waves was broken upon the bed of water itself. This is done, not by opposing a perpendicular face or wall against the billows, but by laying down, far out on the sea bottom, mattresses of osier work filled with rubble or beds of tough clay, on which slope the stone is rammed, making an inclined plane, on which the waves are made to waste their force and thus destroy themselves before reaching the top of the dike. Improving their pile drivers and other tools, the Dutch became exceedingly skillful in the work called zinkstuken, that is, in the making of large mattresses of wattle work and timber that would float until loaded with turf and stones, and then, at the right moment and in exactly the right place, be sunk under the waters to form the bedding upon which the stonework could rest. So soft and treacherous is the sandy bottom that unless piles in great numbers are driven very deep it is not worth while to heap up heavy masses of stone, and the better way is to make a bed of clay or mattress work and rest the basalt columns or pieces upon this. In some places, however, where the water is very deep, ripraps are made by sinking granite blocks pell mell, to protect the ends of the jetties which are placed at right angles to the shore line to strengthen the dikes. These jetties are from one hundred to three hundred feet apart and are sometimes nearly five hundred feet long, besides having sixty or eighty feet of ripraps at the sea end. In front of the famous Petten and Hondsbossche dikes at North Holland we find these outriggers of stone six and seven hundred feet long tipped with eighty feet of riprap work.

With such a variety of level in the country, and with so many heaths and hollows, it is necessary to have some standard level. This is found at the chief city, and is called the Amsterdam pijl, zero, or level, or is usually written or spoken of as the A. P. On the maps of the country made by the Water State, we have the levels of various farms, polders and watercourses expressed in metres or fractions thereof, according to the height above or the depth below A. P. The whole water system is also utilized for national defence, for in case of armed invasion by enemies it is possible to flood large portions of the richest provinces of the kingdom. What has been done in the days of William the Silent and William III. against Alva and Louis XIV. can be done again, if necessary, in the days of Wilhelmina. That the Dutchmen are

quite ready to do it may be illustrated, at least, from an incident which took place shortly after the Franco-Prussian war. When some German newspaper intimated in a cartoon that, unless the Dutch Government did so and so, the Uhlans would be seen as the picture showed, riding down the streets of the Hague, the next week a Dutch newspaper came out with a cartoon, without one word of text or explanation, showing the Uhlans with four inches of water above the tip of their helmet spikes.

Yet, despite all the wonderful things that a Dutchman can do, he cannot make the wind blow when Boreas is not in the mood for work. It has been shown that in each year there are only 130 full days of twenty-four hours which have sufficiently strong winds for working the mills, and although the windmill is still useful and to it the Dutchman must ever have a feeling of gratitude as one of the makers of his country, yet its day is over. Few new windmills are built either in brick or timber. The steam pumps have taken the place of the windmills, and many portions of the Netherlands that were once malarious are now drained and kept dry by them. Indeed it is because the Dutchmen have been helped by steam that their record of drainage and reclamation of land has been so wonderful during this nineteenth century. From 1833 to 1877, the increase was from 8.768 to 12.731 square miles of area. In the days of the Pilgrim Fathers, Haarlem Lake, covering 45,000 acres, was a large body of water with room for fleets to manœuvre in, and over which their boats floated to Leyden. This body of water, typical on account of its size and shallowness, not only covered much valuable sea-clay land, toward which the Dutchman always casts a jealous eye, but in time of storm was exceedingly dangerous to the towns and cities on its banks. The violent wind, blowing long, would drive the waters beyond their bounds, flood the farm lands and menace Amsterdam and Leyden. So it was determined to throttle the dragon, drive out his mermaids, and actualize the dream of Leighwater, dreamed two centuries before, who needed 168 windmills for the work. Three great steam engines, named after famous Dutch engineers, pumping night and day during four years, from 1848 to 1852, lifted 800,000,000 tons of water into the sea, and the lake disappeared. Villages, farms, gardens, fruitful fields, flower beds and hedges, are now on the solid lake bottom. Within the 41,675 acres won to cultivation are 130 miles of roads and canals, 70 bridges, and about 12,000 people. The precious sea clay, making the best bulb land in the world, returns a larger annual revenue to its owners than almost any other part of the kingdom. Other

lakes were drained and vast polders regained to agriculture, making the record of the nineteenth century very wonderful. The polders made from the Y River cover 12,540 acres.

The work of keeping the proper equilibrium between the outer and the inner waters of the country is one that admits of no relaxation of energy or vigilance for a single moment, and the details of dike building, and of canal and ditch cutting for the proper outlet and supply of the waters are of fascinating interest. It actually comes to pass in some dry seasons, when "the river of heaven which is full of water" withholds its supply from the skies, that the direction of the pump screws has to be reversed and fresh water has to be lifted from the rivers to give vegetable and animal life its proper supply. Oftener, however, the skies weep too copiously, and how to wipe off the celestial tears from the landscape is the Dutchman's problem. Infiltration is another frequent cause of danger to his farm.

Such being the history of man's conflict with the water, which furnish him his problems, conflicts and friendships, his help and his harm, it is not wonderful that the story of struggle and triumph, victory and defeat, is mirrored not only in the language and proverbs, but also the art and graphic symbols of the country, and in the habitual action of the minds of the men who lived in this hollow land. The people are like their dwelling place. History has demonstrated that it is not wise for arbitrary rulers to trifle with the people who have been for a thousand years fighting the waters, and liable to be drowned day and night, unless ceaselessly vigilant and prepared for danger. The everyday talk of Mynheer bristles with references to dikes and dams, windmills and polders, bridges and canals, and well-flavored with the salt of wit that reflects the natural environment is the written and the spoken language. In proverbial speech we see "the sheep over the dam," and it is beyond the dike or the bridge that the little Dutch Bo-peep must go to find them. The untested courage of the dog is always greatest and his bark "loudest on his own dam." In Holland the proverbial obstacle in the way is not a wall nor a lion, but a dam. Does a man do his work well? Then it is said that "he has laid a good dam." In parenthesis, we remark that this word dam—spelled without an *n*—has no suggestion of profanity to a Dutchman's ear. Thus a great deal of English fun and many American jokes lose their point and flatten on his tympanum, for he pronounces the word with a long *a* as in father, *i. e.*, Amsterdam, Dubledam. Instead of the nullity which "butters no parsnips," or the tool that "cuts no ice," in

Holland it is that which "brings no sods to the dike." "Who will not dike must retreat before the waters." The "hustler" is a "diker." Men with an unusually good appetite are "polder jongen" or polder boys, and such a man "eats like a diker." The well-to-do farmer has "his sheep on the polder," or "he sits on a droogje;" that is, a dry place, he has a soft snap, a snug berth. Of one in authority it is said he is "the boss of the polder-gasten," or workmen.

On the Dutch Thanksgiving Day the native may say, "Our land lies in a polder."

Perhaps no country is richer in heraldry, armorial bearings and especially in town arms or the graphic symbols which in themselves often tell the story of local history. It is astonishing how many of these *wapen*, or town arms, have upon them the waves or lines representing water, the fishes that have been displaced or serve for food or revenue, the shells, aquatic birds, mermaids, polders, turf bricks or heaps, or the tools by which the wet land has been made dry or conquered from the sea. In one case the mermaid holds up her hand in surprise and despair because men have won her domain to uninhabitable dryness before she could awake. One polder's blazon is a hand rising from the waves holding a cornucopia. The clover leaf and wheat sheaves are the quarterings upon a shield above the legend meaning, "Out of the waves." While old towns on the heaths and especially on the western dry land glory in the saints and the mitred and crosiered lords spiritual, with all ancient heraldry of lords temporal, of dragon, lion, crowned eagle and other symbolism borrowed from mythology, most of the insignia of the communities in the hollows, or won from the waters, show traces of or reveal clearly their engineering history. Probably the most eloquent of all, which also tells the whole nation's story to eye and ear, is that of Zealand. We see a lion struggling out of the waves and semi-fluid land to be free. His head, fore paws and part of his body show strenuous but progressive activity, yet exertion is still necessary, and underneath is the motto, "Luctor et emergo"—"I struggle but I rise." So has the whole story of this land of heaths and hollows been one of constant toil, but also of victory that sublimely shows how man has conquered nature. Yet while on the surface of jest and badinage the natives may assert that they have made the land they live in, their deepest feelings are expressed in that emblem, long ago chosen to express the faith of the Netherlander, who though he write the motto "Eendracht maagt macht," "Unity makes strength," puts alongside of it, or rather above it, the legend containing his own older, profounder and more enduring sentiment, *Nisi Dominus frustra.*

KOREA'S GEOGRAPHICAL SIGNIFICANCE.

BY

HOMER B. HULBERT, SEOUL.

The Peninsula of Korea, forming as it does a stepping stone from the mainland of Asia to the islands of Japan, and forming, together with Japan, an obstruction to the great "Black Stream" which is the Gulf Stream of the Pacific, has not only strategic importance but great ethnological significance.

In order to determine in what this significance consists it will be necessary for us to give a brief outline of the dispersion of the so-called Turanian peoples. This term Turanian is properly and necessarily a vague one, for it covers that portion of mankind who have left so few literary monuments, whose migrations have been so wide and so confusing and whose antiquity is so great that vagueness is an unavoidable quality. Recent study has done something to clear up the mystery, but still this portion of the race remains practically unexploited from the standpoint of the ethnologist. As to the origin of this great family we have nothing but theory, but there are a few large, outstanding facts which afford us at least a clue to a working hypothesis.

In the first place we are sure that the Turanian family antedated the Aryan. It has been satisfactorily proved by Bishop Caldwell and others that the Dravidian people of Southern India are of Turanian origin and were formerly the masters of the Indian peninsula. The advent of the Aryans, with their superior civilization, drove the Turanian inhabitants of India southward into the Deccan, where they survive, unmixed with the purely Hindu population. This Turanian stock, then, while not clearly defined, is confessedly some of the most ancient that can be even approximately placed. But these original inhabitants of India are closely allied, linguistically, to the Mongoloid races of Central and Northern Asia. The philological question has not as yet been exhaustively treated, but enough has been done to prove that there is a strong racial affinity between the agglutinative languages of Southern India and the Mongoloid or Scythian dialects of Northern Asia. It would seem probable that at some immensely remote period, before the Aryan race received its inception or even the Turanian races had taken on distinct form, a primitive race of semi-savages found their way

from the Iranian plateau eastward across the lofty mountain barrier that marks the western confines of China and descended into the valleys of the Yangtse and Hoangho Rivers. This must have taken place before the beginning of the pastoral age, while men still lived by the chase, for by no stretch of the imagination can we conceive of their transporting their flocks and herds across those bleak highlands. In physical characteristics they must have been of the Mongoloid type, but it is interesting to note that the so-called characteristics of the Mongol type—namely, the brachycephalic skull, the oblique eye, etc.—are common to the Malay peoples, the Eskimo and many others; so that these peculiarities alone are not enough to determine the Mongoloid origin of the Chinese people. After this emigration had taken place the rise of the pastoral era cut off these original settlers in China from communication with the dwellers to the west of the great mountain barrier and determined once and for all the isolation of China, an isolation that has remained almost unbroken. With the opening of the pastoral era a second and immensely great exodus took place from the original home of the race. This was the true Turanian family, which, apparently splitting at the apex of the Himalaya and Kuenlun mountains, passed south into the Indian peninsula and north into the steppes of Central Asia. This northern branch, again subdividing, passed eastward into the valley of the Amur and westward into Russia. The eastern branch penetrated to the borders of Korea and even occupied certain portions of the northern provinces of that country.

Meanwhile, the southern branch, which had settled in India, was overwhelmed by a subsequent Aryan invasion and driven into the southern mountainous portion of the peninsula or across the Bramaputra river into Burma. The Malays may not unreasonably be supposed to be the result of this great hegira. But the Malay peninsula proved to be only another point of departure. They spread east and north into Oceanica and into that vast series of islands that stretch from Borneo to Bering Sea. The inhabitants of the Philippine Islands are Malays. The wild tribes of Eastern Formosa are Malays, and there is reason to believe that this great wave of emigration did not break until it reached the natural barrier formed by Japan and the peninsula of Korea. The evidence goes to show that two thousand years ago all southern Korea was inhabited by a people distinct from those of the north and practically unknown to them. They were a people of southern origin, as is proved by a conclusive line of reasoning, both philological and general. If this

be true, and the early settlers of southern Korea did actually belong to the southern branch of the great Turanian family, then it seems that China was simply encircled by the Turanian race, the two branches meeting about the centre of the Korean peninsula.

The argument in support of this theory is a long and complicated one, and it will be possible here only to indicate the most striking points in it. The powerful kingdom of Chosun, in northern Korea, fell in 193 B.C. Its fugitive king, passing southward by boat, came to the southern coast, where he found a people distinct from those of northern Korea in almost every particular. So startling was this difference that it has been clearly indicated in all the historical records of Korea. This difference was so marked that we may assume that the people of the south were of a different origin from those of the north, or at most only very remotely related. Their customs were in almost every case different from those that prevailed in the north. The names of their towns bear almost unmistakable evidence of their southern origin. The people tatooed, they lived mostly near the shore in little maritime villages. Their traditions pointed southward. Their language when compared with those of southern India shows a marked similarity—so marked that this alone would be almost conclusive evidence. We will notice that the "Black Stream" flows along the eastern coast of Asia in a northerly direction; and this must have had its influence, for any shipwrecked men would naturally drift northward. The traditions of the island of Quelpart, off southern Korea, state explicitly that the people of that island came from the south. The names of very many of these maritime settlements or colonies along the southern coast of Korea have endings which are an exact counterpart of Dravidian words, meaning a settlement or village. There is a marked physiological similarity between the people of the Korean island of Quelpart and the natives of Formosa. This is strikingly illustrated in the superiority of the women over the men in physical structure, which is true both of Quelpart and of Formosa. These are a few of the lines along which the argument lies for a southern origin of the people of southern Korea. But as the southern people ultimately came to dominate the whole peninsula and impose their language and customs upon the entire population of Korea, we may say that the Korean people are mainly of southern origin, with, of course, a strong intermixture of the northern element. The readiness and ease with which this assimilation was accomplished may be partly explained on the ground that during all their peregrinations the different branches of the Turanian race,

which, after surrounding China, struck on Korean soil, never lost the agglutinative character of their language. The vocabularies were probably distinct, but the grammatical structure had remained practically intact during the many, many centuries that must have elapsed since the original splitting of the family.

The population of Japan is probably of a similar mixed character. The Ainus, who formerly occupied that country, were in all probability of northern origin, but they were gradually driven out by the invaders from the south. If these invaders had come from the north the remnant of the Ainus would now be found in the south, but their very presence in the extreme north points to the southern origin of their conquerors. But we are met by a very curious problem in this connection. The phonetic systems of Japan and Korea are quite distinct, and the vocabularies of the two countries have almost nothing in common, while the grammar of the two is identical even to details. All a Korean has to do in order to acquire the use of the Japanese language is to put Japanese words in the place of Korean ones in a purely Korean sentence. Why should the grammar show such striking similarities when the vocabularies are so unlike? We may have a clue to this in the resemblance between the phonetics of the Japanese and of the Maori dialects of the Pacific islands. There is a very great similarity, for instance, between Japanese and Hawaiian in this respect, the principal point being the fact that in neither language can a syllable end in anything except a vowel sound. It is not improbable that the Japanese found their way northward from the Malay peninsula by a path which took them far out into the Pacific, while the Koreans took the more direct route up through the islands immediately adjacent to the mainland of Asia. During the long centuries which covered these wanderings vocabularies and even phonetic systems might easily become changed, while the grammar, a far more conservative feature of language, remained practically the same.

When we come down to more modern times we find that Korea exerted a very powerful influence upon Japan. Some two centuries before Christ, when the Chinese Emperor Chin Si proposed the building of the Great Wall of China and began to impress millions of men into this stupendous work, there took place a wholesale exodus of Chinese, who preferred voluntary exile to such a thankless task. Among these fugitives a goodly band crossed the Yellow Sea and found their way into the southeastern portion of Korea. A century and a half later, in 57 B. C., this colony of Chinese had

obtained a strong foothold in Korea. They had brought with them the higher civilization of China, but had wisely united their interests with those of the native Koreans, adopting their language and customs and intermarrying with them; so that after six generations of them had passed away a new combination had been formed and, as is so often the case in cross-breeding, a superior product was evolved which was destined to dominate the peninsula. It was in 57 B. C. that this new element founded the kingdom of Silla, which, growing out from a small centre, rapidly absorbed the surrounding districts until it was conterminous with the present Korean province of Kyung-sang. In this kingdom a brilliant civilization sprang up. Literature, art, science, commerce, flourished. In the ancient capital of that kingdom, the present town of Kyöng-ju, there hangs to-day one of the largest bells in the world. It was cast some time before 500 A. D., and is larger than the enormous bell which hangs in the present capital of Korea. At that time the inhabitants of Japan were little better than savages; but they learned of this new kingdom across the straits, and soon Silla became to Japan what Rome became to Ancient Gaul. It is probable that many subjects of Silla crossed to Japan and became teachers and even rulers. There are curious legends which tell how men from Silla, being supernaturally carried across to Japan, were immediately chosen as chiefs of Japanese tribes. It is very probable that the very noblest families of Japan to-day are descendants of these visitors. It has been a question of some interest to determine the reason of certain marked physiological differences between these noble families and the common people of Japan. All the evidence goes to show that they were this ancient Korean stock who did not colonize in Japan, but who went individually and became the true gentry of that country. Their number to-day in all Japan will not exceed ten thousand. Color is given to this theory by the fact that this superior element was first found in western Japan, opposite the peninsula of Korea.

The geographical position of Korea, then, has been of immense importance in that it has played such a leading part in determining the ethnological arrangement of the peoples of Eastern Asia. It has formed the link between China and Japan, and it has formed the link between two widely separated branches of the great Turanian stock.

But in these days her geographical situation has acquired a new and startling significance from a strategic standpoint. After standing for many centuries between the apathetic Chinese and the insu-

lar Japanese, neither of which ever had the power to overthrow the other, though mutually hostile, she now stands between a rejuvenated, active Japan and an aggressive, ambitious Russia, each of which has special and urgent reasons for desiring to enjoy a predominant position in the peninsula. Her safety seems to lie in pitting the two against each other. It may be that, as Père Hyacinthe said of little Judaea, Korea "has been placed between the great empires as a negation to universal empire—a pacific obstacle to the shocks of their power and the plots of their ambition."

THE CENSUS OF PORTO RICO.

BY

HENRY GANNETT.

The War Department has made public, in three bulletins, the leading results of the enumeration taken in Porto Rico under its direction last autumn.

The census was taken as of date October 16, and occupied about six weeks in field work. The plan and administration were very similar to those of the United States census, the island being divided into seven supervisor's districts, corresponding to the seven governmental departments, and each of these into numerous enumeration districts, with an average population of about 1,000. The supervision and enumeration were done entirely by Porto Ricans, the only Americans employed in the work being General Sanger, the Director, Mr. Harrison Dingman, the Assistant Director, and four clerks.

The population schedules were very similar to those used in the United States census, and the information obtained was in character almost identical. The scope of the census was much more limited than that of the United States, since the subjects of mortality, the defective, dependent and delinquent classes, were not touched upon, and the industries of the island, with the exception of a small schedule relating to agriculture, were untouched.

The results of this census are of especial interest to us as being the first authentic and trustworthy statement of the condition of this people, recently added to our numbers.

The total number of inhabitants of Porto Rico was 953,243. The latest official Spanish census was taken in 1887, and showed at that time a population of 798,565, indicating a decennial rate of increase of 16.2 per cent., a rate about the same as that of Ohio during the decade between 1880 and 1890. The population by department in 1899 was as follows:

Guayama	111,986
Humacao	88,501
Ponce	203,191
Arecibo	162,308
Bayamon	160,046
Mayaguez	127,566
Aguadilla	99,645

Porto Rico, with an area of 3,600 square miles and a population of nearly a million, is, on the average, very densely settled, there being about as many inhabitants to a square mile as in the State of Massachusetts; there is, however, this difference, that while in the State of Massachusetts the greater part of the population is collected in cities, and a large part of it in a few great cities, in Porto Rico the urban element is small, and the population is distributed quite uniformly over the island. There are but four cities whose population exceeds 8,000—San Juan with 32,048, Ponce with 27,952, Mayaguez with 15,187, and Arecibo with 8,008 inhabitants. Thus, the total urban population, under the above definition, numbered only 83,195, or 8.7 per cent. of the population of the island, while the corresponding element of the population of the United States constituted 29.2 per cent. ten years ago, and probably the proportion is to-day much larger. In Cuba the corresponding proportion was even greater, being 32.3 per cent.

Considering as cities all bodies of urban population down to 1,000 inhabitants each, it appears that there are in the island 57 cities, with a total population of 203,792, or 21.4 per cent. of the total population of the island. The corresponding proportion in Cuba was 47.1 per cent., or more than twice as great. Hence, it appears that the people of Porto Rico are essentially rural.

As to sex, Porto Rico contained few more females than males. The disproportion, however, is not sufficiently large to be in any way significant.

The proportion of children under ten years of age was 31 per cent. of the total population, being much larger than in the United States, where it was 24 per cent. The ratio of children was higher in this island than in any State in the Union or in any country of western Europe. The proportion of children of school age, five to seventeen years, was also high, being 33.8 per cent., while it was 29.6 per cent. in the United States; but it is at advanced ages that the most marked differences appear. Persons over forty-five years of age in Porto Rico constituted only 11.8 per cent. of the population, while in the United States they constituted 17.2 per cent., or nearly half as much more—a fact that suggests for the island a large death rate and short life period.

Distributed by race, Porto Rico contained 59,390 negroes, 304,352 persons of mixed white and negro blood, and 75 Chinese, making a total colored population of 363,817, or 38.2 per cent. of the population—a proportion about the same as in the State of Virginia, and somewhat higher than that of Cuba. The proportion of col-

ored ranged in different departments from 14.4 per cent. in Aguadilla to 53.9 per cent. in Humacao. In the latter and Bayamon more than half the inhabitants were colored. The proportion of colored was greater in the eastern part of the island than elsewhere.

Comparison with figures of earlier censuses shows that the colored element, although increasing numerically, has decreased in proportion to the whites, as is the case in the United States and in Cuba.

The proportion of the foreign-born in Porto Rico was trifling, being only 1.5 per cent., and more than half of this element were natives of Spain. Since most of these people of foreign birth were found in the two cities of Ponce and San Juan, the population of the remainder of the island is almost pure Porto Rican.

The conjugal condition of the people of the island is peculiar. Of the total population 69.7 per cent. were single—an exceedingly high ratio, more than 10 per cent. higher than that of the United States. Only 16.6 per cent. of the population were married, and 8.9 per cent. were living together as husband and wife by mutual consent—a condition produced by the great expense of the marriage ceremony. Thus, the total number of unions, either under the law or outside of it, constituted but 25.5 per cent. of the population, as compared with 35.7 per cent. in the United States of persons legally married.

The statistics concerning school attendance show that only 8.1 per cent. of the children of school age were reported as attending school—a fact which is directly correlated with the high percentage of illiterates. Of the persons ten years of age and over 77.3 per cent. were unable to read. This proportion is much higher than in Cuba, where only 56.8 per cent. were illiterate.

The third bulletin relates to citizenship. It discusses the males of voting age, classified by birthplace, race and literacy. Of this class of the population only 3.8 per cent. were of foreign birth, of which 2.8 per cent. were born in Spain. Of the natives 25 per cent. only were able to read. Classifying them by race, the literate whites constituted 29.4 per cent. of all whites, and of the colored the literates constituted only 17.2 per cent. Under an educational qualification, therefore, the suffrage of the island is restricted to 47,973 persons, or about one-fourth of all the males of voting age.

BRITISH HONDURAS.

BY

W. L. AVERY.

This colony, which has been developed from the original "settlement" of Belize (a name now applied to the capital only), is the single dependency of Great Britain in Central America, and lies between the parallels of 15° 54′ and 18° 30′ N. lat. and 88° 10′ and 89° 9′ W. longitude. It is about 900 miles south of New Orleans and 600 miles west of Jamaica. It contains, with the adjacent cays, an area of 7,562 square miles, or nearly the area of New Jersey. It is bounded on the north by the River Hondo, which thus separates it from the State of Yucatan. On the south the Sarstoon river divides it from Guatemala. On the east the boundary is the Caribbean Sea, and the western boundary is the Republic of Guatemala. The seaboard extends for 180 miles, and the long line of cays provides a breakwater so entirely effective that no gale from the East or the dreaded northers are ever felt on its shores. The surf may break with great force on these cays, but the inner waters are ever calm, or comparatively so. South of Belize every river mouth or "bar" is the place of a settlement either of a few huts or a considerable village. The geographical features of the northern and southern halves are entirely different. The northern half is generally flat, with a slight incline from the western frontier to the sea—virtually a plain of some 1,000 square miles. The southern half is entirely different, having the range of the Cockscomb Mountains, beginning at the Sibun and running south, with the highest peak some 3,700 feet above the sea-level. The western portion of this southern half is undulating, grassy country, with fine pasturage lands, and is uninhabited; but some gold-bearing quartz has been reported, as well as indications of other minerals. As there are no wagon-roads in the colony, all transportation must depend on the sea and the many rivers. The river-system is extensive, and the streams, running as they do from west to east every few miles, with their windings, afford the means of traffic to all necessary points in the interior. They are generally of a depth of six or eight feet, with very few rapids. The Hondo, on the north, is navigable for large boats—not vessels—for 50 miles from its mouth. The New river (I am giving them from north to south) flows parallel with the Hondo, and can be navigated for 70 miles. The Belize river is the longest in the colony, and, rising in the Blue Mountains of

Guatemala, it follows a very tortuous course of 150 miles—twice the length in a straight line from its source to its mouth. With a depth from 6 to 9 feet and an average width of 140 feet, it forms the great highway or waterway of British Honduras. There is a necessary portage at the Falls of Roaring Creek. The Falls are only 10 feet in height, but their charm consists in their surroundings. They are in a high defile, which, from the water's edge to the summit, is covered with a wealth of vegetation unknown outside of the tropics. The majestic mahogany, towering 100 feet skyward, the giant cotton tree with its far-spreading buttresses, the waving bamboo with its feathery leaves, and the dense and beautiful smaller growths, with the perfectly clear water tumbling brightly through its channel, make a scene well worth a few days' trip to see. The Sibun river enters the sea ten miles south of Belize after passing through a somewhat hilly country. The Manatee river, 25 miles south of Belize, is narrower than the others, and the bar at the mouth is the roughest in the colony. Some miles from its mouth a remarkable stoppage occurs, the river being there supplied from an underflowing body of water—a stream flowing through a narrow cave of a mile in length. Mahogany is still floated down, however, though at flood-time it is a dangerous venture. The Mullins river is navigable some 30 miles from its mouth, and is very deep and slow-flowing, with most of the valley under banana and plantain cultivation. The Sittee river is by far the prettiest, though the rapids some twenty miles from its mouth make it perhaps the least useful. The scenery is so essentially tropical and wonderfully beautiful that the tediousness of its difficult navigation is forgotten. The Southern Stann Creek river rises in the mountains and flows through a country rich in game; but its navigation is slow and uncertain, the stream being obstructed with rocks and boulders, and Chase Falls and Big Falls adding to the difficulty while enhancing the beauty. Twenty miles further south is Monkey river, a stream which 12 miles from its mouth is a deep and narrow creek. The next watercourse is Deep river, which is formed by the uniting of four creeks of equal size 12 miles from its mouth. Deep river boasts a "boiling spring" of hot water impregnated with sulphur and iron, and with a temperature of 84°. Lying between Deep river and the Sarstoon are Golden Stream, Middle River, Rio Grande, Rio Moho, and Rio Tomash, all flowing through a country entirely undeveloped and practically uninhabited. I have enlarged on the river-system because it renders possible the development of agricultural industries, and with the coming of the railway it settles forever any question of efficient transportation.

The towns of British Honduras are Belize, Corosal, Stann Creek, Punta Gorda, and Orange Walk. The first recorded mention of a settlement at Belize was in 1638, when a few mariners and adventurers formed the nucleus of what has become entirely a wood-cutting and trading community. At first a settlement, then a superintendency, later a dependency of Jamaica, in 1884 a full Crown colony was established, and Belize is its capital. All the public buildings are situated here, and it is the chief city as well as the capital. Corosal, the second town in importance, is situated almost on the extreme north of British Honduras, eight miles from the Mexican boundary, and, unlike Belize, it is high above the water-level, on the edge of the largest plain in Central America. This town is of Spanish origin, as is proved by the records of the refugees from Yucatan who settled it and from the general plan of the laying out, with a plaza in the centre about 100 yards square, with the Roman Catholic church facing it on one side, and the streets running at right angles, unlike any of the other towns in the colony. The people, too, are unlike the other inhabitants of the more southern districts. Stann Creek is built along the shore for over a mile, and the beach is dignified by the title of the "Marine Parade"—for its people consider it the Brighton of the colony. It is the one town that does not depend on the rainfall for its water supply, as a clear, pure stream flows through it. The inhabitants, some 2,500, are largely of Carib origin, and rely for their support on the sale of fruit to the steamers. Punta Gorda, elevated about twelve feet above the water, is also built along the water front for some three-quarters of a mile. Here is located a small community of citizens of the United States, who coming there shortly after the Civil War and engaging in sugar-making and cane-planting have made a success of it, and only lack capital to make it an immense enterprise. The sugar is wonderfully rich in quality, and the example of these honest Southerners will lead to a great development of the industry in the future. There are 12 sugar mills and over 1,000 acres under cane. The undulating grass lands in the vicinity of Punta Gorda, with here and there a noble tree, give the landscape a park-like appearance very agreeable to the English eye.

The coast of this colony is well lighted. And, indeed, it needs to be; for though the weather is ever clear, the uncertain but very powerful currents along the shores and among the cays render good lights necessary, for the great essential of the navigator—viz., experience—counts for little when the force and direction of the current is unknown.

THROUGH THE SILK AND TEA DISTRICTS OF KIANG-NAN AND CHEKIANG PROVINCE.

BY

EMIL S. FISCHER.

The interest of the whole world is again centred in China, on account of the Boxer Rebellion. Since the quelling of the Tai-ping rebellion in 1864 the Chinese Government has had little trouble to face in the interior of so great a country, but after the Chinese-Japanese war in 1894 the reigning Emperor had to subdue the Mohammedan revolt in Kansu and several other uprisings in different parts of the country. Another menace was the secret societies, whose aims were the exclusion of foreigners from China and the murdering of missionaries and converts. It is hoped that the present disturbances in the Middle Kingdom will soon be pacified, so that foreigners may be able to travel safely in the interior. There is no doubt that one of the sources of the opposition to foreigners arises from the economic danger that the coolie classes apprehend in the new means of communication and transportation, which threaten to deprive them of their chief means of income as carriers and runners. The Chinese prefer their slow and primitive way of travel—and the methods of getting about in China are very different from ours. During my stay of five years in China I made frequent journeys into the interior, and was compelled to accommodate myself to the Chinese methods of travel. Once I was about to visit the well-known Ping-Shui valley, in which region most of the famous green tea of that name is cultivated, much of which is consumed in America. I soon found a convenient Mandarin boat, which took my Chinese teacher, my boy-servant and myself to the Imperial city of Hang Chow, with its beautiful views. The vessel on which we travelled was a very commodious one, of flat construction. My teacher occupied the compartment on the forepart of the ship. My room, which contained an opium sofa, stools and a table, was a little larger. The only thing which interfered with our comfort was a plague of insects. My boy-servant put himself in a place adjoining the bunks of the dozen coolies who served as sailors. These were supervised by the Laodah, or boatman.

Our journey was fairly agreeable at the start. We made arrange-

ments with a so-called steamboat train. This is a daily-running steam launch, which, since the opening of Hang Chow as a treaty port in 1897, plies about these waters, towing several Chinese freight and passenger boats. It takes about two days, at the rate of about five miles an hour, to reach Hang Chow. The country which we traversed is known for its fertility, but the general aspect of the territory along the Whang-pu and the Grand-Canal is monotonous. We passed through several populous cities. We were especially taken with the cities of Ka-Zay and Ka-Shing, situated upon the borders of the Imperial Canal. On the outer wall of Ka-Shing we noticed the three interesting sister pagodas, Santa-se. While I was on deck I was the object of curiosity to the assembled natives, who immediately called me "Yang Kwei tze," denoting foreign devil. We reached the foreign settlement of Hang Chow after midnight of the second day of our journey, having been stopped about midnight at the Custom-house of the foreign settlement, where we were registered. We immediately started for Hang Chow City, which is about six hours' travel from the settlement, then consisting of the Custom-house bungalow, a semi-foreign-built house, a missionary hospital and several godowns, which are storage places for the merchandise of the port. The tugboat, which could proceed no farther, now left us. According to Chinese custom, we should have had to remain in the settlement all night; but I compelled the Laodah to proceed, and also asked him to wake me if for any reason the boat should have to stop. About three o'clock in the morning I was informed that we had arrived at an obstruction in the canal. It was one of those primitive canal locks consisting of a mere embankment, with a provision for raising the boat by a derrick. The coolies in charge of the station were fast asleep. Our boat had to move to shore, and as soon as this was done I sprang on land with a big Japanese stick. With this I almost broke the door of the hut where the would-be watchman was enjoying a good rest. I finally awakened him, and with some small coins persuaded him to hurry to seek a dozen coolies, who were to take our boat over the lock, known as "Hole-over." The Imperial Canal has a great many such locks in the neighborhood of Hang Chow; they are of ingenious, antique construction, and prevent the floods of the Yellow Sea from overflowing the country.

It took some time before our boat was fastened with very strong manila ropes. The coolies tried their best to bring us over as quickly as possible, as they seemed to intend to continue their

slumber; but the pulley did not work fast enough, and it took much time, with all possible energy, to raise the heavy Mandarin boat to the top of the embankment. From this embankment it slipped down to the opposite side of the canal by its own weight. We were now ready to continue our journey to the city gate of Hang Chow, where we arrived about five o'clock in the morning.

The gate was still closed. No entrance is permitted until sunrise. We anchored in the midst of hundreds of boats in a large basin of the canal. Most of the boats around us were filled with articles of food, which were intended for the Hang Chow market.

It was long after six o'clock, and the city gate was still closed. I waited patiently on deck for the moment of opening, but when at half-past six we were still in waiting, I began to fire cartridges, and made such a noise that finally one of the officials appeared on the top of the wall to discover the cause of the alarm. I called to him to hurry and open the gates. He promised to do so, but it took some time before the guards were dressed and ready to open the heavy wooden entrance. A very curious sight struck me when we entered the archway of the gate; about fifteen or twenty guards were at the gate around and robbed every boat as it came along. Those boats which passed in the middle of the stream were the only ones that escaped the general pillage.

Our boat continued the voyage through the suburbs of Hang Chow. It took another hour before we completed the first stage of our journey. We had to stop in a muddy stream. Around us were a great many flower-boats, where the gayeties of life begin with sunset and are carried on with all the decorous solemnity of thorough Bowery life. At this hour on these boats all the singing girls and Chinese musicians were fast asleep. But I could judge from the neighborhood that we had landed on the Hang Chow Bowery.

While my boy packed our belongings, I went on shore with my Chinese teacher and made arrangements with chair-carriers to take us through the very populous city and noted surroundings. We also hired a dozen coolies to carry all our packages to Hsi-Hsing, a city opposite the mouth of the river, named Tsien Tang Kiang, on which Hang Chow is situated. Hsi-Hsing is over thirty li, or more than ten miles, distant. My teacher and I took the palanquins, or chairs, and we began our inspection. We were carried to the western gate of the city, where the walls rise by the charmingly pretty Western-Lake. The lake is surrounded by beautiful hills, on which stand inviting temples and pagodas, and it is dotted with little islands, which are connected with one

another by means of peculiar Chinese arch bridges. We left our chairs and took a little trip around the lake. Then we went to the top of a hill, upon which stood a pretty little house, built in European style, next to an old ruined pagoda. I discovered that this attractive residence was the summer home of the Church of England missionaries of Hang Chow. We were enchanted with the grand view from this point. We proceeded on our journey and stopped at several Yamen, the official residence of the Chinese Mandarins. We also entered the great and handsome city temple, which Buddhistic house of worship is situated on a hill within the walls of the town. In the business street of the city we entered several silk shops and looked at the beautiful Hang Chow silks. This city boasts of an Imperial silk factory, the looms of which turn out yearly thousands of pieces of the finest kind of silk, mostly consumed by the Imperial household in Peking. My teacher visited several tea-houses and bought some of the finest kind of Ping-Shui tea.

We arrived at the ferry just before the last afternoon boat crossed the mouth of the Tsien Tang Kiang. This capacious boat did not look very clean. It was filled with vegetables and all kind of food stuff, besides general freight, a number of coolies and other passengers. We were happy to possess chairs, in which we were carried on the boat and placed in some sort of a reservation for palanquins, but could not escape the odors that emanated from the variegated cargo. I could not remain in the chair, but went to the stern of the boat, where I could at least get some fresh air behind the open sail. It took about a half-hour to reach the southern bank of the stream. We were, luckily, in time to see the bore or great flood which, during the equinox, approaches the coast of Hang Chow with thunder-like noise; it appears like an enormous water-wall, which rises up to 24 feet, arriving with great velocity at the embankments of the Hang Chow Gulf, entering also the Tsien Tang Kiang. The gulf and the river are very dangerous at such times to the shipping world.

We proceeded now to Hsi-Hsing, which was about 15 li distant. Our coolies carried us to a tea-shop, where our boy was awaiting us with our belongings. The place was filled with a number of dispatch-boatmen, who offered their boats. I soon perceived by their enormous prices that they had formed a kind of trust. I succeeded after some hunt in procuring the upper deck of a freight-boat, which seemed to me safer and more comfortable than travelling by dispatch-boat. At night I discovered, to my dismay, that my fel-

low-passengers on the lower deck were largely composed of pigs and geese, who did not hesitate to make the night hideous with their peculiar noises. Along the river to Shoa-shing is a chain of mountains, forming the eastern extremity of the Himalaya.

We arrived at Hsiao-Hsing at dawn. First I ascended one of the surrounding hills to seek invigoration after the ill effects of the night journey. The hill was situated near the city wall, and I had a splendid view of Hsiao-Hsing's prominent dwellings, pagodas and temples, most of which were on the banks of creeks. Hsiao-Hsing is termed generally "the Venice of China," only because of the many creeks and canals which break the city up into numerous islands; but in no other respect can it be fairly compared to the beautiful, poetic Venice.

Before my departure I visited the temple of the 500 Apostles of Buddha, called the Lohans. They consist of a gallery of fine gold carvings. On departing, and before passing the South-Eastern City gate, we saw a great number of Chinese statues, generally known as "Women Monuments." These monuments are erected by edict of the Chinese Emperor, and they set in most cases an example to the posterity of faithful women. One of these monuments attracted my special attention. It bore both a Chinese and a European inscription. I went ashore and examined it, and found that it was a memorial to the French soldiers and sailors who fell in subduing the Taiping Rebellion of 1862–64.

From this place we started with two dispatch-boats for Yu-Yao. These boats, also called post-boats, are about 9 or 10 feet long and about 3 or 4 feet wide, tapering to a point at both ends. They are covered with a thatched roof, supposed to serve as a protection in all kinds of weather. The boat is generally manned by one coolie, who propels it by pushing the oar with his foot and holding the steering rudder in his hand. These dispatch-boats are specially adapted for travel in shallow waters. The boatman, while using his leg in propelling the boat, prepares the meals, and attends to both duties without trouble. He cooks his food with the unoccupied hand, and crams the rice into his mouth with the "chopsticks" in a quiet way and without any inconvenience. We were soon out of the city gate. The boat I travelled on led the way, and behind followed the second boat, containing my teacher and boy-servant. The channel soon broadened, and we drifted on the Tzao-Wu-Kiang, which lies between mountains and beautiful valleys and passes through the famous Ping-Shui valley. A few miles from Hsiao-Hsing we saw a romantic Mandarin garden for the amuse-

ment of pleasure-seekers. The typical spot for amusements in China is one containing many bridges, caves and labyrinths. Such was this park, built close to the mountains and to the water. I intended to reach the Hole-over watershed at Shang-Yu in the evening, otherwise we should have had difficulty in getting over the broad embankment before the next morning. I therefore urged the two boatmen to hurry down the stream; I was satisfied, because we covered a distance of 100 li, or about 33 miles, in nine hours. Our progress by boat was here impeded by a stretch of intervening land, over which our boats had to be carried on the backs of coolies to reach the continuation of the waterway. We resumed our water journey until we reached the gates of Pa-Kwan. I was awakened from my sleep by the coolie, who told me that the Mandarin soldier refused to let us pass the gate. My argument with the soldier proving futile, I directly entered the Yamen near-by, where I found one room lit up. I went straight in and surprised a lot of Mandarins coolly smoking their opium pipes, while others were playing games. It was comical how they jumped on seeing a stranger. I addressed them most politely in the Mandarin language, and demanded that we be allowed to continue our voyage. They granted my wish most courteously, and one of the Mandarins himself went to open the gate. We were now on the straight way to Yu-Yao, where we arrived at about six o'clock in the morning. We came to the landing-place of the Yu-Yao-Ningpo steamboats.

My teacher and also my boy-servant, carrying our baggage, took the opportunity to reach Ningpo before evening by means of this Chinese morning boat. I preferred riding a whole day down the river on a dispatch-boat, to which I had accustomed myself, for I could not stand travelling on one of those ill-smelling Chinese steamboats. I expected to reach Ningpo late in the evening, so went ahead with my dispatch-boat, and stopped at a pretty little hill, where I thought of getting off. I made the coolie understand that I wished him to meet me a little farther down the stream, where another spur of the mountain approached the river. When I arrived there he was awaiting me. I had this same experience with my boatman several times, and was always successful. The country was very interesting. Sometimes I went to a small village. Rice was cultivated in most of the fields, and the hillsides showed pretty tea plantations. About noontime, when I again left the boat to take a look into one of the valleys, I underrated the distance. I therefore tried to get straight down from the midst of the

valley, traversing muddy rice-fields, until I reached the river, believing that I could meet my boat along the bank of the stream. After a very long and fatiguing walk through these fields, I came to the water front, where, to my great disappointment, I could not find my boat. I called for my boatman, but without avail. I was almost in despair what to do, when some cormorant fishing-boats passed down the river. I attracted their attention. They rowed over, and agreed to take me down the river in their most uncommodious raft, on which two fishermen and a dozen birds were placed.* After more than an hour's floating we passed a larger place on the bank of the river, and I became convinced that in order to find my boat I must retrace my way. I landed, and at once took a sailing craft going up the stream. The wind blew at a good rate, and my perseverance was finally rewarded by finding my boat, which bore my coat as a flag. When questioned the coolie explained that, as he had not found me, he rowed back and quietly waited at the place where I had left him.

The day soon darkened, and the coolie rowed down the river. I dreaded to sleep in this most uncomfortable position on the floor of the boat, and luckily found a substitute oar, and with this I helped the coolie row, and thereby we completed our trip in half the time it would otherwise have taken. At about 4 A.M. we approached Ningpo. It was not very easy to steer clear of the many junks and other vessels, without any light, anchored in the harbour. We succeeded in this also, and finally arrived at the landing-place of the foreign settlement, where about thirty foreigners live. I went afterwards to the bungalow of the Custom-house, where my friends expected me.

I did not return to Shanghai by the overland route. I had accomplished my desire of studying the silk districts of Hang Chow and the tea plantations of the Ping-Shui valley. There are few foreigners, with the exception of explorers and missionaries, who dare to undertake such tedious voyages. The means of communication are in no way inviting, and railroads are still in the distant future.

After a sufficient rest in Ningpo, I took the coast steamer to the so-called Eastern model settlement of Shanghai.

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* Cormorants are commonly used in China for fishing purposes. A ring, fastened around the neck of the bird, prevents the cormorant from swallowing the quarry.

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

FRESH-WATER DEPOSITS OF THE WEST.—In recent papers (see, for example, *Proc. Amer. Acad. Arts and Sciences*, XXXV, 1900, 345–373) Prof. Davis has raised a question concerning the geology of the West which has attracted a great deal of attention. It is a well-known fact that throughout the West there are extensive deposits of sand and gravel which have been almost universally ascribed to lacustrine origin. Upon the basis of these deposits the recent history of the mountainous West has been interpreted somewhat as follows: First, broad seas with projecting mountain spurs; second, with the growth of the mountains, a narrowing of the seas and a closing of the inlets, transforming the seas to estuaries, and later to lakes; finally, with the continued growth of the mountains and the dragging of rock fragments down the mountain slopes, the lake basins have been destroyed. During this period the mountainous West was a region of numerous and extensive lakes.

The purpose of Prof. Davis's paper is to question the lake origin of the deposits as a universal explanation and to suggest as an alternative hypothesis that a fluviatile origin will apply to certain regions. This explanation has certainly been in the minds of some geologists, as, for instance, in explanation of the peculiar and very extensive beds which fill the valley of California; but it is to Prof. Davis that we owe the first clear and specific statement of this point of view.

After a summary of the published statements concerning these supposed Tertiary lakes, Prof. Davis considers the characteristics of lake deposits and discusses the characteristics of fluviatile and other deposits, and he also considers special instances of accumulations in the West which have been ascribed to lake origin. He declares that the object of his papers is to promote consideration rather than to announce conclusions. There seems little doubt that in studies of the West the lacustrine origin has been assumed in many cases without critical consideration of other possible explanations, particularly that of fluviatile origin; and it is by no means impossible that a careful analysis of the facts in each instance will show that at least some of the so-called lake beds have in real-

ity been accumulated in basins by the washing of river and rain waters and without the intervention of lakes.

Glacial Erosion.—The tide of opinion seems to be setting toward a belief in the effectiveness of glacial erosion where local conditions favor. That is to say, after the revulsion following the extreme views upon the subject held by early geologists, students of the subject are now taking the middle ground. This change of opinion is very well illustrated by two recent papers from the pen of Prof. Davis. (*Appalachia*, ix, March, 1900, 136–156; *Proc. Boston Soc. Nat. Hist.*, xxix, 1900, 273–322.) Eighteen years ago a paper published by Prof. Davis took a rather strong stand against the extreme view of great glacial erosion; but he now says: "In a retrospect from the present time, it seems to me as if one of the causes that led to my conservative position was the extreme exaggeration of some glacialists, who found in glacial erosion a destructive agency competent to accomplish any desired amount of denudation—an opinion from which I recoiled too far."

During recent travels in Europe Prof. Davis has seen evidence in various places that ice has operated locally to a marked extent, and it is a description of these observations which constitutes the main basis for his papers. His most important evidence of glacial erosion is that which is offered by certain valleys down which ice has moved with rapidity, lowering the bottoms of the main valleys below the floors of the tributaries. This condition he calls "overdeepened main valleys and hanging lateral valleys." One of the most typical cases which he has seen is that of the Ticino valley in the Alps; but he describes others in Norway and refers to other instances.

The paper in the Proceedings of the Boston Society closes with a review of previous writings on the same subject, and this review of the literature is interesting in that it shows to what extent glacial geologists are returning to the belief that ice can erode very markedly where conditions are favorable. To the writer of this note Prof. Davis' conclusions are of considerable interest, since the basis for his conclusions, resulting from his European studies, is almost exactly the same as that which I presented in 1894 in explanation of the Cayuga Lake Valley. (*Bull. Geol. Soc. Amer.*, v. 1894, 339–356.)

The Illinois Glacial Lobe.—For many years, under the direction of Prof. Chamberlin, much detailed work has been done upon the glacial geology of portions of the middle West. Among the

assistants of Prof. Chamberlin the one who has done the most continuous work is Frank Leverett, and from him glacial geologists expect important results. He has already published a number of papers, but the first extensive work which has appeared from his pen is his recently published Monograph on the Glacial Lobe of Illinois. (*Monograph U. S. Geol. Survey*, xxxviii, 1899.)

The ice which covered this portion of the country was supplied from the northeast, and, according to Leverett, its history has been very complex. Much of the Monograph is devoted to a description and consideration of the several till beds and the intermediate weathered zones, together with a description of the moraines and other glacial features. It is impossible to abstract so long a monograph in the space that is available here; but one of the striking portions of the work is the chapter devoted to the question of the depth of the drift in Illinois—a State that is well calculated to furnish information on this point because of the large number of wells and borings. Leverett has carefully gathered the information which these furnish, and from his study concludes that the average depth of the drift in Illinois is from 100–130 feet.

The chapter devoted to the study of the glacial Lake Chicago is also of especial interest. This lake, which overflowed into the Des Plaines and thence into the Illinois river, covered the site of the city of Chicago, and the beaches marking the various levels are still to be seen, some of them within the very city itself. There is also a portion of the Monograph devoted to a consideration of the changes in the rivers as a result of the glacial invasion. It is just such studies as this which glacial geology needs to serve as a basis for explanation of phenomena which, though obscurely understood, nevertheless have no lack of hypotheses in explanation.

The Glacial Gravels of Maine.—One of the most striking features in the glacial geology of Maine is the presence of extensive beds and ridges of gravel. The latter, known as osars or eskers, though locally called by other names, such as hogback, are to be frequently seen in driving across the country. In fact, many of the roads run along the crests of these eskers for a considerable distance. They vary in height from three feet to over one hundred; some of them are in the open country, but a great many are in the woods, and, in consequence, are very difficult to study.

Attracted by the remarkably clear development of these forms, Stone undertook to work out the problems which they presented, and completed his work in 1889, although the results were not pub-

lished by the Geological Survey until ten years later. (*Monograph U. S. Geol. Survey*, xxxix, 1899.) This monograph consists of descriptions of the general features of the glacial geology of Maine and a detailed description of the extensive gravel deposits, particularly the eskers. In Maine these are found to be confined to the river valleys, in the main stretching continuously for long distances, though often broken by gaps of considerable size. The several esker systems are named and the deposits mapped, and the monograph closes with a discussion and a classification of the features of individual deposits, being particularly detailed on the subject of eskers. It is to such painstaking studies that we must look in the future for the basis upon which to generalize concerning the conditions during the Ice Age. Besides the credit which belongs to one who gives so much time to extensive local studies, additional credit is due for intelligent work in the midst of such difficulties as those which must have been met with by Stone during his studies in the wooded portions of Maine.

Geology of Narragansett Basin.—From a number of standpoints the region about the shores of Narragansett Bay is of marked interest, and the publication of a monograph by Shaler, Woodworth & Foerste (*Monograph U. S. Geol. Survey*, xxxiii, 1899) furnishes an answer to many of the questions that have been raised concerning the geological history of this rather remarkable region. In a deep basin of Carboniferous time there were accumulated a succession of beds similar to those of other coal regions. Then, succeeding the period of deposition, there came a time of uplift, doubtless connected with the Appalachian revolution, which succeeded in producing very much more marked effects of metamorphism upon the coal measures of this section than was the case in the Appalachian coal-fields. The mountain-folding which has been responsible for the metamorphism has consisted not merely of rock-folding, but of much faulting, and the geological structure of the region has been still further complicated by the intrusion of masses of igneous rock. The subsequent erosion of this complex of rock material has resulted in the formation of the present basin, depressed between massive crystalline rocks on either side, and, through recent sinking of the land, transformed at the lower margin to an arm of the sea.

MAP NOTICES.

BY

HENRY GANNETT.

Since the publication of the last Bulletin the U. S. Geological Survey has made notable additions to the map of the United States in the form of thirty-eight sheets, a majority of which are in the eastern part of the country.

In New Hampshire are two sheets, on a scale of 1:62,500, with a contour interval of 20 feet, known as Peterboro and Whitefield. Both these sheets represent undulating or hilly country, diversified with occasional monadnocks. Near the centre of the Peterboro sheet is the well-known peak Monadnock, a typical mountain of this character.

Four sheets, situated about the junction of the three States of Massachusetts, Vermont and New York, have been combined in forming the Taconic sheet, which, on a scale 1:125,000 and a contour interval of 40 feet, represents admirably the relief features of this hill country.

In New York are no fewer than eleven sheets, all on the scale of 1:62,500, with a contour interval of 20 feet. Wilmurt and Canada Lake are in the Adirondacks, representing hill country, abounding in lakes and marshy streams, the result of the extensive glaciation of the region. Remsen is farther to the west, and shows a country of comparatively low hills, which also has been extensively glaciated. Schoharie lies in the Helderberg Plateau, and shows a dissected region, with broad, well-graded stream valleys. Little Falls includes part of the valley of the Mohawk, with the hill country bordering the Adirondacks in the northern part of the sheet. Baldwinsville, lying farther to the westward, represents a region of glacial deposits, including many beautiful examples of drumlins. Oswego, lying north of the latter and bordering on Lake Ontario, is also diversified with many beautiful drumlins, whose axes show a remarkable parallelism, trending about south-southeast. Fulton lies east of Oswego, also bordering upon Lake Ontario on the north, and presents similar characteristics. Canajoharie includes a part of the valley of the Mohawk, with the escarpment of the Helderberg plateau in the south. Cherry Creek, in the western part of the State, represents a dissected plateau, with broad stream valleys. Dunkirk shows a portion of the low shores of Lake Erie, with the plateau rising abruptly a few miles inland.

In New Jersey are two sheets, Raritan and Passaic, each of which is a combination and reduction of four sheets, the scale being 1:125,000, with a contour interval of 20 feet. Passaic includes Jersey City, Newark and the Oranges, with the beautifully curved ridges on the outskirts of the Appalachians. Raritan lies directly west of it, and is mainly occupied by the parallel ridges of the Appalachians and the narrow valleys separating them.

In Pennsylvania are three sheets, the first results of the resumption of work in that State produced by the co-operation of the State with the Federal authorities. These sheets are upon a scale of 1:62,500, with a contour interval of 20 feet. Erie includes the city of that name, with the lake shore, and in the southern part the escarpment of the Allegheny Plateau. Fairview lies directly west of Erie. The third sheet, lying south of Fairview, is occupied in the main by the lower slopes of the Allegheny Plateau, in which, as in other similar regions, the streams, recently revived after being graded, have become deeply incised.

Co-operation between the State of Maryland and the Federal authorities has resulted in considerable work, and among the sheets produced are seven lying entirely or partly in this State. All these are upon a scale of 1:62,500, with a contour interval of 20 feet. In the low country in the eastern part of the State is the Betterton sheet, including the country near the head of Chesapeake Bay—a low region, whose altitude nowhere exceeds 100 feet above sea-level, while much of the shore of the bay is marshy. Havre de Grace lies north of Betterton and represents the head of Chesapeake Bay and the lower course of Susquehanna River. Cecilton lies east of Betterton, in the northeastern part of the State, and represents a low, level region, with estuaries at the mouths of all the rivers. Elkton is north of Cecilton and represents a similar region, with its relief a little more accentuated. The other three sheets of Maryland are situated in the western, mountainous portion of the State, and bear the names of Accident, Oakland and Flintstone.

In Illinois is one sheet, Highwood, upon a scale of 1:62,500, with a contour interval of 10 feet. It is situated north of Chicago, and represents a level, glaciated country, with steep bluffs along Lake Michigan.

In Iowa is one sheet, Anamosa, upon a scale of 1:125,000, with a contour interval of 20 feet. It represents a somewhat broken prairie region, in which the streams are deeply incised.

At the junction of the States of Wisconsin and Iowa is the Lancaster sheet, upon a scale of 1:125,000, with a contour interval of

20 feet. The Mississippi river flows across this sheet in a bottom-land two miles in breadth, bordered by steep bluffs several hundred feet in height. Its tributaries are all deeply incised in the prairie.

In western Kansas are two sheets, Lakin and Syracuse, both on the scale of 1:125,000, with a contour interval of 20 feet. These sheets adjoin one another, and are traversed by the Arkansas river in a broad bottom-land, bordered on the north by bluffs of considerable height, while upon the south is a broad stretch of sand-dunes.

In Indian Territory are three sheets, known as Sanbois, Atoka and Coalgate; these are upon a scale of 1:125,000, with a contour interval of 50 feet. They lie mainly in the Choctaw Nation, although the first-named includes a portion of the Cherokee country. This sheet is the only one which shows decided relief, its southern part being occupied by the crooked ridges of the western extension of the Ozark Hills.

In Colorado is one sheet, Engineer Mountainon, a scale of 1:62,500, with a contour interval of 100 feet. This is in the San Juan Mountains, in the southwestern part of the State, and contains several high summits, the most prominent of which, as well as the highest, is Engineer Mountain, with an altitude of 12,962 feet.

In Nevada is one sheet, Silver Peak, upon a scale of 1:62,500, with a contour interval of 100 feet. This sheet represents the Silver Peak Range, a broad, irregular mountain mass, together with desert valleys at its base. It presents a number of excellent illustrations of alluvial cones built by the streams which flow from the mountains into the valley, and there disappear.

In California are two sheets—Fernando in the southern part of the State, upon a scale of 1:62,500, with a contour interval of 50 feet. This represents the western part of the San Gabriel Mountains, with the San Fernando Valley at their south base. The other, known as San Luis, is upon a scale of 1:125,000, with a contour interval of 100 feet. It includes a large area of the coast ranges in the vicinity of San Luis Obispo, together with a long stretch of the Pacific coast.

The War Department has recently issued an excellent map of northeastern China, representing that portion of the "Flowery Kingdom" which is most in the public eye at present. The scale is about 20 miles to an inch, and the map includes the territory from latitude 30 to 42° north, and longitude 112 to 124° east.

NOTES ON CLIMATOLOGY.

BY

ROBERT DEC. WARD.

THE INFLUENCE OF CLIMATE ON MILITARY OPERATIONS.—The more closely we study the relations of climate and man, the more striking is seen to be the control which climatic conditions exercise over the many activities and peculiarities of the human race. That the influence of climate may clearly be seen in many of the migrations of men from one country to another has long been recognized. Even the smaller details of such migrations, whether peaceful or warlike, often point distinctly to climatic or meteorologic control. In the latter connection reference may be made to a recent publication, in which emphasis is laid upon the influence of climate on military operations. The volume is entitled *Outlines of Military Geography*, and is by T. Miller Maguire, LL.D. (Cambridge Geographical Series, Cambridge, England, 1899.) The discussion in question is contained in Chapter XIV, of which the title is *Influence of Climate on Military Operations*. After pointing out the importance of military organization and good hygiene, and noting that "the inhabitants, however well used to the climate, will perish if unprepared, while the invader, if provided with all requisites of clothing, food and drinks, will thrive," Lieut. Maguire enumerates a number of cases in modern warfare in which accidents of climate and weather have resulted in disaster to armies. Napoleon's unfortunate invasion of Russia, rashly undertaken, furnishes a terrible illustration of the effects of a severe northern winter. In 1877, the Russians lost over 6,000 men at Shipka during the frost and snow of the storm of December 18–23. In January, 1814, a sudden thaw obliged the French troops to undergo the most terrible fatigue in forcing their way through the deep and miry alleys of the forest of Der during their movement from St. Dizier to Brienne. During one of Gen. Grant's campaigns in Virginia, after several days of fair weather, there came a very heavy rain, which lasted a day and a night. As related in Porter's *Campaigns with Grant*,

> "the country was densely wooded and the ground swampy, and by the evening whole fields had become beds of quicksand, in which the troops waded in mud above their ankles, horses sank to their bellies, and waggons threatened to disappear . . . . The roads soon became sheets of water, and it looked as if the saving of that army would require the services, not of a Grant, but of a Noah."

Other instances of a similar kind are cited, and, as a whole, the chapter is extremely suggestive both to the student of climatology and to the student of military science. A recent illustration of the difficulty of campaigning during a rainy season has been furnished by the experience of the American troops in the Philippine Islands, to which reference was made in these NOTES in Vol. XXXII of the BULLETIN (No. 1, 1900), pages 43–45.

THE BOXER OUTBREAK IN CHINA AND THE CHARACTER OF THE SEASONS.—Closely allied to the subject referred to in the preceding paragraph, and a very recent instance of the influence of weather conditions upon history, is the fact that the "Boxer" outbreak in China, which has precipitated a war of international importance, whose end it is as yet impossible to foretell, was to some extent due to the character of the season immediately preceding this outbreak. In an article on The Chinese Boxers, in the *National Geographic Magazine* for last July, Mr. L. J. Davies emphasizes the importance of the seasonal control over the welfare and the conduct of the people of Northern China in the following words:

"It must be borne in mind . . . that economic conditions greatly assist the organizers (of the Boxer movement). In good seasons the people of North China must secure two crops each year from the same land in order to maintain a condition of average welfare. If the spring yield fails there is considerable suffering, and if spring and fall crops are bad, conditions of local famine result. A considerable proportion of the people are therefore always on the verge of destitution. In seasons of distress, highway robbery is very frequent. The more wealthy travellers carry arms, and during the winter months housebreaking is so common that one or more members of well-to-do families watch all night. Hence, beginning by looting the homes of Christian Chinese, the 'Boxers' proper attracted to themselves a great company of the hopelessly poor, who, joining them for plunder, would be as ready to fall away when the booty was no longer to be obtained."

Another writer on the "Boxer" outbreak, Arthur Sowerby, in the *Contemporary Review* for July, also mentions among the causes of the outbreak the scarcity of rain in the preceding autumn, and calls attention to the fact that the winter days, when the villagers and canal population are idle, were spent by these people in drilling.

SWISS GLACIERS AND OSCILLATIONS OF CLIMATE.—In the *Rapport de la Commission Internationale des Glaciers*, presented to the International Geological Congress held in Paris during the past summer, the results of the studies of the Committee in regard to the glaciers of the Alps are thus summarized: After 1810 there was a marked and rapid advance of the ice, which reached a maximum about

1820. Between 1820 and 1850 there came a slight recession in cases where the glaciers did not remain stationary, and towards 1850 a new advance took place, similar to the first (1810–1820). Next a general and considerable retreat took place, which was so marked between 1860 and 1880 that it almost seemed as if the Alpine glaciers would disappear entirely. About 1880 the retreat of the glaciers of the western Alps, especially those of the Mont Blanc group, began to stop, and a new advance commenced in some cases. In the eastern Alps the glaciers did not follow suit until 10 or 20 years later. In general, it can be said, with certainty, that the period of great retreat has ceased, and has been replaced by movements in the opposite direction. The interesting point in connection with these studies, from the standpoint of a climatologist, is the relation of these variations in the glaciers to climatic oscillations. The *Commission Internationale des Glaciers* shows that these variations in the Alpine glaciers correspond to the 35-year period of climatic oscillations discovered by Brückner. The periods 1806–1825, 1841–1855 and 1871–1885 were rainy. Each one of these periods brought a corresponding advance of the glaciers, which was very strongly marked in the first two periods, and was suggested in the last.

The Cause of Sunstroke.—One of the difficulties in the way of the acclimatization of the white man in the tropics is sunstroke, which, according to district and season, plays greater or less havoc with white residents, and especially with white troops, in certain tropical countries. Every discovery that throws any light on the cause of sunstroke is especially welcome at the present time, when the "control of the tropics" is a subject of such paramount importance to so many nations. About two years ago the theory was advanced by Dr. Sambon that sunstroke is an infectious disease, and is due to the influence of a certain distinct microbe. This view, which was radically opposed to the ideas previously held on this subject, led to considerable discussion, but was not generally accepted. Recently Mr. E. H. Freeland, who, according to *Nature* (Aug. 23), has had exceptional opportunities of observing cases of sunstroke both ashore and afloat, shows, in the *Middlesex Hospital Journal* for July, that the older view as to the cause of sunstroke seems to him sufficiently to explain all the facts, and to be well supported by the evidence at hand. Mr. Freeland concludes as follows:

"Whether sunstroke be due to external physical causes, or whether it be an infectious disease and due primarily to a micro-organism which has yet to be isolated,

must be decided in the future. For the present it seems to me that there is ample evidence for believing that sunstroke is due primarily to thermic influences—the exposure of the body to a hot, moisture-laden atmosphere—and, secondarily, to the circulation in the blood of certain toxic poisons, the result of perverted tissue metabolism; and that, until more tangible evidence is brought forward to prove that the affection is due to microbic influence, one may safely accept the older doctrine with regard to its causation as a sound working hypothesis, if nothing else."

THE WEST INDIAN HURRICANE OF SEPTEMBER 1–12, 1900.—The first scientific report upon the West Indian hurricane of last September, which will probably go down to history as the "Galveston Storm," has been published in the October number of the *National Geographic Magazine*, and was written by Prof. E. B. Garriott, of the Weather Bureau. The presence of a disturbance in the vicinity of the Windward Islands was indicated in the weather reports of the last days of August. During the first three days of September the hurricane moved west over the Caribbean Sea, and on the 4th, during the night, recurved northward over western central Cuba. On the morning of the 6th the centre had reached the southern portion of the peninsula of Florida. The path up to this time had been normal. During September 6 the hurricane made an abnormal curve to the westward, increasing in intensity and causing severe gales from the western Bahamas to Florida. Moving westward over the Gulf of Mexico, the storm centre reached the Texas coast late on the afternoon of September 8, and then recurved northward, passing directly over Galveston as a fully developed hurricane. The lowest barograph reading at Galveston was 28.53 inches at 8.10 P.M., when the centre passed over the city. The storm then advanced northward over Texas, Oklahoma and eastern Kansas, reaching Iowa on September 11. Here the dissolution of the disturbance seems to have been averted by the advance of a second cyclonic depression from the northwest, which strengthened the original storm. The further movement was to the eastward, over the Great Lakes, the St. Lawrence Valley and Newfoundland, there being a constant increase in intensity. The chief interest in this hurricane, apart from the terrible tragedy at Galveston, is the fact of the two sharp abnormal curves in the course of the storm—one over the Florida peninsula and the other on the Texas coast.

NOTES ON GEOGRAPHICAL EDUCATION.

BY

RICHARD E. DODGE.

THE SCHOOL OF GEOGRAPHY AT THE UNIVERSITY OF OXFORD.—The school of geography at the University of Oxford has entered upon its second year, with the same staff as last year, and a much more perfect plan of work. During the Michaelmas Term of 1900 regular lectures will be given by members of the staff on the following topics: The Historical Biography of the British Islands; the Development of Geographical Ideas; the Atmospheric Circulation; the Geographical Cycle; and the Geographical Development of the Roman Empire. Practical instruction in the laboratories will be given on four days in the week.

The examination for the diploma in geography, candidates for which must have studied in residence for one academic year, was held in June, 1900. The scope of the examination is indicated by the following outline:

The figure of the earth and the determination of positions on its surface. The principles of surveying and of mapping. Map projections on the plane, the cylinder and the cone, and their commoner modifications. The reading, reduction, and generalization of maps, and the representation of climatic and statistical data. The methods of meteorological and hypsometrical observation.

The configuration of the continents and of the bed of the ocean. The characteristics, history, and distribution of the chief land-forms, of the several types of mountain-systems, river courses and river basins, and of the coastal belt. The cartographical analysis of the forms, structures, and activities of the physical regions of the world.

The distribution of solar energy on the rotating earth and the resulting circulations of air and water. The modifying effects of the distribution of land and water. The climatic provinces of the earth.

The physical conditions of the oceanic areas and the methods of observing and representing them.

The chief generalizations regarding the distribution of animals and plants.

The geographical distribution of men according to number, race, and economic and political condition. The influence of physical features in determining the position of settlements and lines of communication.

The outlines of historical geography considered in relation to the influence of physical features.

The history of geographical ideas. The outlines of the history of discovery.

It will readily be seen that the opportunities at Oxford do not as yet rival the opportunities at certain of our American universi-

ties, though more attention is given to cartographic work and to historical geography than is common with us. It is to be hoped that the work may be increased in the near future, so that students may have a more elaborate course open to them. The scholarship of £60, open to students, is a favorable sign of the support that the school is receiving.

PHYSIOGRAPHY AT THE HARVARD SUMMER SCHOOL FOR CUBAN TEACHERS IN 1900.—It is probably well known in the educational and scientific world, both here and abroad, that Harvard University opened its doors during this last summer to more than 1,200 teachers brought from Cuba to take a six weeks' course at the University. Among the subjects selected for presentation to the teachers as a whole was physiography. Lectures were given to the entire body, followed by field excursions to places of particular interest in the vicinity of Boston. The lectures dealt with the simpler phases of the science, and were given, of course, in Spanish by Mr. Mark S. W. Jefferson, of the High School, Brockton, Mass. Mr. Jefferson was eminently qualified to conduct the work, not only because of his experience as a teacher and worker in physiography, but because of his training in Spanish gained through a residence of several years at Córdoba, Argentina, where he was engaged in scientific work. References in both the lecture and field work were made to Geikie's *Nociones de Geología* and *Nociones de Geografía Física*.

The excursions were twelve in number, the body of teachers being divided into groups so that each group had two trips a week. The excursions were to Medford, Mass., to study soil and rock weathering; to Beaver Brook, to study transportation; to the Cambridge Clay Banks, to study deposition; to Atlantic, to study marine deposition; to the Cambridge Slate Quarries, to study consolidation and elevation; to Hobbs Brook, to study valley carving; to Neponset Marshes, to study river deposition; to Riverside, to study terraces; to Nantasket, to study shore lines; to Clifton, to study ocean erosion; to Arlington Heights, for a general review; and to Melrose, for a review of differential erosion.

The University published a small pamphlet in reference to the excursion, with general directions in English and Spanish; general directions as to method of observation were given in an introduction, and under each excursion a series of leading questions was asked.

The success of the work was very great, and it is a great com-

pliment to the science of physiography that this subject was selected by the Harvard planners of the school to represent the science group in the school work.

COMMERCIAL GEOGRAPHY FOR NEW YORK BUSINESS SCHOOLS.—The course in Commercial Geography outlined for the business schools of New York State by the University of the State of New York, in Bulletin 13, College Department, February, 1900, deserves more than a passing notice, because it is one of the first official publications along this line.

Ideas in reference to what should be included under the head of commercial geography are very varied, differing from the early training of the enthusiast. Publishers and teachers who are anxious to have commercial geography advance rapidly are, on the whole, uncertain of the best lines. Some believe that a commercial course should be "practical": that is, give the student an encyclopedic knowledge of the commercial possibilities of any particular area; others take the opposite position, that students should gain from the study of commercial geography not merely a series of facts connected in space only, but rather general laws and conceptions in reference to the controls of commerce the world over—in other words, that the course should be scientific rather than merely informational in character.

The course noted above belongs distinctly to the latter class, the commercial possibilities of the United States being apparently the key-thought. After a few introductory conceptions in reference to political and physical geography, the student is called on to make a careful study of the possibilities for internal commerce in the United States. Great Britain and her colonies and other countries are then considered with almost equal care.

The work is to be summarized by a study of the distribution of the more important commodities. In this section the causal idea is to be brought out in a general way. The following outline in reference to Turkey will illustrate the manner of treatment:

> TURKEY (including the Levant). Raisins, cotton, tobacco, attar of roses, carpets and rugs; wool and woollens, opium, licorice root, figs; international communications; chief city; two cities of Asia Minor.

It is to be hoped that the Departments of Commerce, already established by the University of the City of New York, and projected by Columbia University, may soon bring about a much-needed improvement in the commercial education of business schools, and especially in commercial geography.

THE BULLETIN OF THE AMERICAN BUREAU OF GEOGRAPHY, whose appearance was announced in this BULLETIN (XXXII, 1, 1900), has now gone through three numbers, and has won its place among the attractive helps for American geography teachers. In association with the Bureau is a Committee, which arranges to exchange products between different parts of the country. The most valuable work of the Bureau thus far seems to be in securing the possibility of purchasing valuable lantern-slides at a reasonable cost. Full particulars regarding the slides, with illustrations, will be found in the first and second numbers of the *Bulletin.*

The *Bulletin* has published a number of valuable articles, which have appeared with a pleasing typography and with many illustrations. The editor is to be congratulated upon his success, and it is to be hoped that some practical results of his work may be seen in our schools in the near future.

PHYSICAL GEOGRAPHY AS OUTLINED BY THE REGENTS OF THE UNIVERSITY OF NEW YORK.—The Academic Syllabus, issued by the Regents of the University of New York, has just passed through its semi-decade revision, and physical geography teaching has profited thereby. All teaching in the secondary schools of New York is largely determined by the demands of the Regents, as outlined in the syllabus, and hence those interested in special lines of educational progress welcome any advance secured each five years, because all schools concerned profit more or less thereby.

Pressure has been brought upon those in authority, within the last few years, to make the approved course in earth-science a progressive and continuous one-year course, with laboratory work. The Board has, however, outlined a twenty weeks' course in physical geography that may be followed by a twenty weeks' course in geology, thus making a one-year course in earth-science possible, though not of the strongest kind.

All geographers will not be able wholly to endorse the description of physical geography as outlined, and many will regret that the syllabus does not more strongly emphasize the necessity of a scientific and causal treatment, particularly because of the educational value of such work. The field of physical geography is outlined as follows:

"It takes up the causes that determine the configuration of land masses, the action of bodies of water, the various atmospheric phenomena, and the relations to each other of land, water and air. It also treats of geologic and astronomic relations, and deals with the physiographic influences on vegetable and animal life. It performs its highest mission, not in its treatment of inanimate nature or of soulless organisms, but in

showing that the earth exists for man, and is of interest because it constitutes his physical environment. This syllabus regards the subject from the latter point of view, and does not attempt to require the solution of the problems that are studied in the other sciences."

A strong appeal is made for the encouragement of field work, especially in connection with the physiographic processes, and a weak suggestion is made that laboratory work is a possibility. It is greatly to be regretted that the Regents have not taken a strong stand in favor of definite laboratory courses in association with lecture and text-book work. A secondary course in physical geography cannot come up to the standard of a college entrance requirement until, like the other sciences, it is studied for at least a year with laboratory work.

The following are the larger topics suggested as belonging to physical geography: The earth as a planet; its motions and the effects thereof; distribution of land and water; the properties of air; climate; the phenomena of light; winds; storms; rainfall; the composition and motion of ocean waters; the forms of the land; islands; plains and plateaux; mountains and volcanoes; wasting of the land; rivers and river valleys; springs and lakes; glaciers; distribution of plants and animals; man and nature.

It may be said that the course is a composite of old and new ideas in reference to physical geography, and that, unfortunately, unsystematic physical geography seems to have the right of way.

GEOGRAPHICAL RECORD.

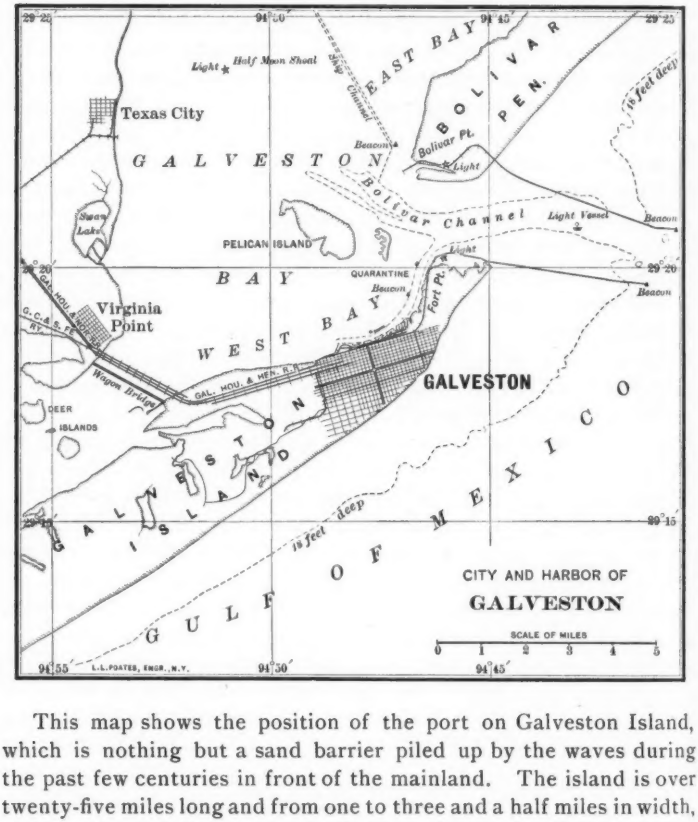
THE UNITED STATES.

POSITION AND TRADE OF GALVESTON.—The harbors along the coast of Texas have little importance for international commerce, except Galveston and Sabine Pass. All the other indentations are too shallow to admit large vessels. Sabine Pass is at the extreme southeast corner of the State. The Government has spent large sums in improving the entrance to its land-locked lake, and its business in lumber shipments is now important. Its harbor is commodious and deep, but its disadvantages are that it is not so conveniently situated as Galveston for communications with the interior of the State, and, furthermore, the railroad system of Texas has been developed with Galveston in view as the natural geographical outlet by sea for the cotton, cattle, and other products of that region.

Galveston, nearly 300 miles west of the Mississippi delta, is centrally situated on the coast of the best-watered, most fertile and most populous part of Texas. The Brazos valley, the largest river basin in the State, and growing the best and most abundant crops of cotton, is directly tributary to it. There are four large railroad centres in Texas, from which lines radiate to all points of the compass, and these receiving points are all feeders of Galveston's commerce. These railroad centres are Dallas, surrounded by great areas of cotton and wheat lands; Fort Worth, the largest centre of the Texas cattle trade; Waco, which forwards much of the export cotton of the Brazos valley; and Houston, where 7,000 miles of railroads converge, and which has both rail and water communication with Galveston. Thus, without Galveston, the entire transportation system of the State, as developed, would be thrown into confusion. The advantages of Galveston's geographical position and its excellent harbor, and the consequent convergence upon the port of the inland freight routes which tap large agricultural and grazing regions, have made this city, in recent years, the second cotton port in the Union, and doubled her export business between 1892 and 1899. Last year Galveston was the fourth export port of the country, being surpassed only by New York, Boston and Baltimore.

Thus, while the development of Sabine Pass as a large seaport is mainly in the future, the necessity for Galveston had already

been demonstrated and its development achieved before the terrible cyclone of September 8 nearly destroyed the city. The rebuilding of the port began as soon as possible after the calamity, not only because there is need for it, but also because there is no reason to believe that such a storm will ever again assail it; and, moreover, experts express confidence that engineering works may be provided that will prevent the recurrence of such a disaster.



This map shows the position of the port on Galveston Island, which is nothing but a sand barrier piled up by the waves during the past few centuries in front of the mainland. The island is over twenty-five miles long and from one to three and a half miles in width, and the city stands some two miles from its northeast end at Fort Point. The reëntrant known as Galveston Bay, formed by a number of flooded valleys, extends into the mainland for about thirty miles north of the city, but is everywhere too shallow for the use of the larger ships, except a comparatively small area at the entrance to

the bay and along the water-front on the north side of the city. This field, however, is large enough to meet the needs of a great commerce, and is of sufficient depth to accommodate the largest modern vessels. Between this singular depression and the deep water of the neighboring sea, just in and outside the channel that forms the entrance to the harbor, is the usual fringe of shoal water; but it is only about two miles across. It is here that the Government has made improvements to facilitate entrance to the port. About $8,000,000 have been expended in building jetties, extending from Fort Point and Bolivar Point two miles gulfward. This large engineering work has been successful; the channel has been scoured through and a permanent deep-water passage secured from the Gulf into the Bay. Extensive dockage and warehouse facilities stood on the bay side of the city at the time of the cyclone, and others were building. Many wharves were injured only in parts of their superstructure. The map shows the three railroad bridges and the wagon bridge that connected the port with the mainland. All of them were swept away, and eight railroads have now combined to build for their purposes a double-track steel bridge, ten feet higher than the single-track bridges that were destroyed. It was found after the storm that the port itself was scarcely injured, and it has to-day a safe depth of twenty-seven feet.

The city extends across the island from the Bay to the Gulf, and its site is from six and a half to ten feet above mean tide-level. Earlier storms had given warnings, but they were not so serious as to create apprehensions that the city could be overwhelmed as it was on September 8. A storm thirty-three years ago caused the water to rise about six and one-half feet above mean tide, flooding the lower levels of the town. In the storm of 1875 the rise was a few inches higher; while in 1877, when the wind blew sixty miles an hour, the rise was only a little over five feet. In September last the wind exceeded a velocity of 100 miles an hour, but was chiefly important as the cause of the high seas that wrought most of the destruction. Galveston was in the vortex of the storm, and was simultaneously overwhelmed by waves both from the Gulf and the Bay. Still, many buildings on the higher levels escaped absolute destruction, while the ruin wrought on the lower levels was almost complete. A number of engineers have suggested plans for the future protection of the city; and it is not unlikely that a Commission will be appointed to agree upon the best means of safeguarding this important seaport.

SAN DIEGO AS A SEAPORT.—Two years ago, San Diego, Cal., had practically no sea trade, while to-day ocean vessels are discharging merchandise there and loading with cotton and other products for the Orient. This is due to the improvements recently made in the port. The citizens have expended about $1,000,000 in wharves, and the Government is completing a jetty at the harbor entrance, by which means it is expected to scour out the sand and mud bottom, so that the largest vessels may enter at any time. As it is, the depth of water at the entrance is twenty-two and one-half feet at low tide, which is only two feet less than at San Francisco. Merchandise to the value of $2,631,599 was exported last year, which was more than ten times the value of the export trade in 1898. If the rate of exportation for the first quarter of this year is maintained throughout, the exports in 1900 will be at least $6,000,000. The imports grew from $142,108 in 1898 to $1,501,588 in 1899. The annual report of the San Diego Chamber of Commerce says it is expected there that the port, in a few years, will handle all the shipping trade of the southwest part of the country and an important share of the trans-continental trade. San Diego is connected with the Southern Pacific system as well as the coast lines of railroads; and as there is no practicable port for large shipping to the north till San Francisco is reached, it is greatly to be desired that the advantages of San Diego may prove adequate for the development of a large commerce.

NATURAL GAS.—The Twentieth Annual Report of the United States Geological Survey says that though natural gas in this country has been much reduced in quantity it bids fair to be a resource of considerable importance for years to come. The long-continued drain is felt in nearly all the fields long worked, but many companies are keeping up a full supply to their customers by extending their pipe-lines to new grounds. Thus the value of the natural gas produced in Ohio began to decline in 1892; but the decline was arrested in 1898, when the product was worth a third of a million dollars more than in 1897, owing to increased production in the Lancaster field, where new and vigorous wells were developed. In some districts, deeper drilling may tap new reservoirs, and discoveries are likely to be made in territory not yet adequately explored. Kansas, for example, has recently developed considerable new gas territory. The consumption of natural gas is now far more economical than in the early years of its use, as a given amount of effective work is now performed with less than one-half the quantity of gas

that was required at the time of its introduction. The estimated value of the coal and wood which it displaced in 1898 was over $18,000,000. Its largest use is to supply heat and light for domestic purposes. It is found in many thousands of homes in the western parts of New York and Pennsylvania and in northern Indiana, north-western West Virginia, north-eastern and north-western Kentucky and south-eastern Kansas. It is also used for domestic purposes, to a smaller extent, in Texas, Utah, Colorado, California, Illinois and Missouri. Its use for industrial purposes did not include quite 1,200 establishments in 1898, and its restricted consumption in this field will, of course, tend to prolong the life of the gas wells.

New Gold Finds in Alaska.—Though the Koyukuk river and its tributaries are not yet thoroughly explored, mining prospectors have discovered mineral resources in that basin which promise to be of much value. The Koyukuk, about 700 miles in length, is one of the two largest northern tributaries of the Yukon. Its sources are not far from the Porcupine river, the other large tributary, and it flows to the west, north of the Yukon Hills, and then south, joining the Yukon about 400 miles from its mouth. Early in 1898 a few miners located pay-dirt on the gold belt that runs through the territory, about 600 miles up the Koyukuk. The reports, last fall, that they were doing finely, led to the departure of several hundred miners from the Klondike in the spring of this year. Consul J. C. McCook writes from Dawson that about 200 miners left that camp with pack horses and mules to take the overland trail from near Fort Yukon to the new fields; and another party started on a steamboat for the mouth of the Koyukuk, which they intended to ascend to the diggings. The whole region is reported to be rich in gold indications.

A Government party will sledge up the Koyukuk on the river ice early next spring. It will go to the Altenkakat tributary, about three-fourths of the way to the gold discoveries, and then strike north up that river and carry on explorations through the unknown northern part of Alaska to the coast of the Arctic Ocean. Supplies were cached, last summer, on the Altenkakat for the use of the exploring party next spring.

Surveys in Alaska.—It is doubtful if knowledge of any other part of the world has grown so rapidly in the past two years as that of Alaska. The Government surveys and explorations have been vigorously carried on in the past season. A Geological Survey

party, under Mr. E. C. Barnard, has been making a topographical survey of the Seward Peninsula, the westernmost extension of Alaska, between Kotzebue and Norton Sounds. The Cape Nome gold district is on its south-west coast, and the newly discovered gold region of Cape York is on its north-west side. The map of this region is to be on the scale of four miles to the inch. Another party, under Mr. Alfred Brooks, studied the gold resources in the Cape York district, and another expedition, including Mr. W. J. Peters, topographer, and Mr. W. C. Mendenhall, geologist, went inland from Kotzebue Sound to trace southward the gold-bearing belt that seems to extend south-west across the peninsula, and is now being worked at its southern terminus on the sea. The Coast and Geodetic Survey also sent two steamers, the *Pathfinder* and the *Patterson*, to survey the entire coast from St. Michael to Cape York and Port Clarence, giving special attention to harbor facilities, if any exist. Thus five expeditions have been at work on Seward Peninsula and its coasts, and the result of this season's pioneering in this northern part of Alaska is expected to throw as much light upon that region as last year's surveys contributed to the knowledge of the more southern parts of the territory.

SOUTH AMERICA.

Exploration in the Nineteenth Century.—Prof. Dr. W. Sievers, in his exhaustive article on geographical exploration in South America in the present century (*Petermanns Mitteilungen*, VI, 46 Bd., 1900), says that, up to 1875, no Government on that continent had sent out any expeditions or spent any money to explore the unknown parts of its territories. Nearly all the exploration of this century, excepting in Chile and Argentina, has been the result of private enterprise, mostly by European and North American explorers. Thus none of the Cordilleran States, from Venezuela to Chile, has, as yet, emerged from the stage of rough, pioneer exploration. A considerable portion of their territory, as in the south-eastern part of Colombia, is still almost wholly unknown. Some of them, like Bolivia, have made no attempt, except in small districts around their chief towns, to carry out official surveys. Conway, who recently passed through New York on his return to the Bolivian Cordilleras, is doing for Bolivia what other explorers, chiefly German, have done for the Ecuadorian ranges. Among the Atlantic States, the Guianas, except for a narrow strip along the coasts, are still on the threshold of exploration. Brazil has no establishment like our Geological or Coast and Geodetic Survey to make a scientific study

of any part of its vast domain. All the official explorations in Brazil are the work of some of the individual States. Scarcely a traveller has crossed any of the north-eastern States, from Maranhão to Pernambuco; and much of the interior, except along the river courses, is still quite unknown. The wide wildernesses between the large tributaries of the Amazon are completely *terra incognita*.

In Argentina, however, very satisfactory progress in exploration has been made in the past quarter of a century. In 1882 the first collected results of the Government's activity in this direction were the large atlas of the country, prepared under the care of the geographer Seelstrang. Argentina has geological and meteorological establishments, and foreign scientific men in the service of the State and the Universities, whose labors have greatly enhanced the value of all official geographical work. The systematic study, which both Argentina and Chile have, for some years, given to the ranges along their common frontier, has made a large portion of this the best-known part of the South American Cordilleras. The reason why Africa, as a whole, is better known to-day than South America is because so many European nations, eager for foreign territorial acquisitions, have so zealously participated in its exploration; while in South America the poverty of the various States and their political disturbances have prevented them from contributing largely to the knowledge of their own continent. Thus there is more opportunity for pioneer exploration in South America than in any other continent, though the Spaniards crossed it from sea to sea over three centuries ago, and nearly every city on its coasts was founded in the era of the Columbian explorers.

The Harbor at Buenos Aires.—The *Buenos Aires Herald* says that the Argentine Government has spent in twelve years nearly $50,000,000 in building a series of docks and basins for the accommodation of the shipping at that port. The mistake was made, however, of building a port without an adequate entrance to it. No preliminary study was given to the variable currents of the La Plata, nor any heed to the fact that enormous quantities of silt surcharge the river waters. Channels for the admittance of vessels were dug right across the currents, and they filled, or partly filled, with silt nearly as fast as they were dug. The result is that the approaches to the fine series of docks are lamentably inferior to their capacity and to the demands of commerce. The Government has now appointed an expert Commission to study all the conditions and report a practical plan for the construction of an enduring approach.

EUROPE.

POPULATION OF SARDINIA AND SICILY.—A. Cossu, who has made a study (*Riv. Geog. Ital.*, *Fasc. II.–III.*, 1898) of the distribution of the population of Sardinia in respect of distance from the sea, finds that since 1845 the population has been gradually increasing near the sea and decreasing inland. At an earlier period the malarial coasts and the attacks of pirates were strong influences driving population inland. At present, however, the density of population on the coast of the island is 46 to the square kilometer; from the coast to five kilometers inland, 34; and further inland, from 22 to 31. The steep and malarial coast facing Italy is for considerable distances almost uninhabited. This study recalls the investigation made by O. Marinelli in 1893 on the distribution of population in Sicily. He ascertained the fact that while the greatest density of the northern and eastern slopes is found on the coasts, that of the southern or African slope occurs entirely at a height above sea-level of over 1,300 feet. He attributed this fact to the influence of malaria and the unsettled state of the country in the Middle Ages, when the population was driven inland. In discussing these conclusions Dr. Theobald Fischer (*Petermanns Mitteilungen*, 1893, No. 8) expressed the opinion that the scanty population along the African coast is due still more to the natural characteristics of that coast, where the steep cliff of tertiary strata affords no natural harbors and where there were no suitable sites for strongholds to repel the attacks of pirates from the Barbary coast. Furthermore the rainfall is small, there is little level ground for cultivation, springs are scanty, and even the principal streams afford poor facilities for irrigation.

POLAR REGIONS.

THE DUKE OF THE ABRUZZI returned to Tromsö in the *Stella Polare* on the 6th of September. His ship was fast in the ice for eleven months, and her sides were crushed by the pressure. She was pushed on the land, and four sledge parties were sent out to make explorations. One of these parties, composed of a Norwegian and two Italians, never returned. Another, led by Capt. Cagni, was gone 105 days, and reached the highest latitude yet recorded—86° 33′ N.

The general health of the party was good throughout the voyage and there was comparatively little suffering.

On the 11th of September the Duke arrived at Christiania and was received with the greatest enthusiasm. Nansen welcomed him on behalf of the University, and at night there was a grand torchlight procession.

LIEUT. AMDRUP'S GREENLAND EXPEDITION arrived at Copenhagen on the 4th of October. The party landed at Cape Dalton, 69° 25′ N., on the 19th of July, and Lieut. Amdrup mapped the coast to 67° 20′, the point at which the work ended in 1899. Dr. Hartz, at the same time, was employed in exploring and charting the coast to the northward as far as Scoresby Sound.

TWO ANDREE BUOYS have been discovered. One, marked No. 3, was picked up in the open sea, on the west coast of Iceland, on the 7th of July. When opened at Stockholm, in the presence of Nordenskiöld, Nathorst and others, it was found to be empty. The second buoy (No. 4) was reported from Skjervö, Norway, on the 31st of August. It contained a notice that it was thrown out at 10 P.M., on the 11th of July. At the time of writing the balloon was at an altitude of 250 metres (820 feet), and moving in the direction N. 10° East. A postscript adds that the direction had changed to N. 45° E., that the balloon was above very rugged ice, with splendid weather, and that four carrier pigeons had been released, and were flying west.

Andree made his ascent July 11, 1897.

CAPTAIN BAUENDAHL was to leave Hamburg in the middle of August on an expedition to the North Pole. He describes his plan in a communication dated July, 1900:

There go with me a pilot, R. Dressler, and five seamen. The vessel is a deep-sea fishing boat, the *Matador*, of 44 tons. It has no engine. I propose to make for the pack-ice north of Spitzbergen and then to steer to the eastward till I come to open water or a channel which seems to offer a passage for the ship to the north. If I find the water, I shall push as far north as possible till the way is closed, when I shall leave the vessel perhaps, at the Seven Islands, and press on over the ice with the crew and the provisions. It depends upon the currents, the ice, the land and other conditions whether the return route shall be by way of Franz Josef Land, or Greenland, or in some other direction.

My reasons for choosing my route and method are that previous attempts to reach the Pole in ships have been frustrated by the masses of ice or, when open water invited advance, by the dread of risking the vessel and the desire to keep it for a base. So far as I know, no one has yet pushed his ship into the pack-ice northeast of Spitzbergen. Parry in 1827 found himself north of Spitzbergen, where, owing to the encounter of the Gulf Stream with the Polar current, the wall of ice seems to be especially compact. It appears to me that, more to the eastward, the conditions may be such as to afford an opportunity for progress with a ship.

Should we find ourselves compelled to take to the ice, we know from the examples of the *Hansa* and the *Polaris* that men can travel over the ice-field if they have sufficient food and fuel. I carry enough of these for two years—a weight, that is, of about 200 hundred weight—to drag with us at first; but I hope to make my way even over rough ground and to obtain at the same time scientific geographical results.

Whatever Capt. Bauendahl may do in the Arctic, his success in finding six men to help him pull a load of ten tons to the North Pole is a remarkable feat, and all must wish him and them a safe deliverance from a ship with such an evil name as *Matador*.

Mr. William Ziegler, of New York, proposes to fit out and dispatch an expedition to the North Pole in the summer of 1901. There will be two ships, and the leader of the expedition will be Mr. Evelyn B. Baldwin, who was with Peary in Greenland in 1893, and a member of the Walter Wellman party in Franz Josef Land in 1898–99.

Mr. Baldwin has been attached to the U. S. Weather Bureau.

The Berlin correspondent of the London *Standard* gives some details of the construction of the ship for the German Antarctic Expedition. It is a wooden, three-masted schooner, with strong ribs, and triple woodwork of oak, pitch pine, and greenheart, for protection against the ice pressure. It is hoped by this means to obtain sufficient strength without adopting the peculiar form of the *Fram*. The ship will have a triple-expansion engine capable of an average speed of seven knots. The space under the forecastle will be prepared for about fifty draught dogs. All the available space will be turned into coal-bunkers. Besides five ordinary boats an oak naphtha-boat will be taken, six metres long and two broad, and capable of holding fourteen to twenty persons, or 2,500 kilograms. The engine, of four horse-power, will give the boat a speed of from four to five knots. A captive balloon, with the necessary filling apparatus and a searchlight apparatus, will be taken; also a wind-mill for the working of the dynamo-engine, when the boiler is not under steam. Termination Island, geographically still little known, will probably form the first objective point of the expedition.

GEOGRAPHICAL RELIEF MAPS: THEIR USE AND MANUFACTURE.

BY

COSMOS MINDELEFF.

Geographical and topographical maps in relief have not attained the use which their advantages merit. This is due, not to any lack of appreciation of the system—for opinion on that point is practically unanimous—but to a variety of causes, prominent among which may be mentioned the high first cost of such work, and, in a lesser degree, a prevailing impression that any one can make a relief map. Such an impression invariably leads to disappointment, and the system is condemned when the fault lies only with the workmanship. A relief map is essentially a portrait, and we can no more expect good work from a novice in that line than in any other line of portraiture—sculpture or painting, for example. In either case the workman must have a definite and clear conception of the final result for which he strives; otherwise his work will be worthless. Another element which has had some bearing on the problem of the wider use of relief maps is a disposition on the part of those for whom they are usually made, generally scientific men, to look more closely after the manner of making than after the result—an apotheosis of method, as it were: not an uncommon failing in other branches of scientific work. None of these tendencies, however, seems insuperable.

Concerning the advantages of relief maps over other methods of picturing a section of country there is little difference of opinion. Contrary to the usual experience, on this point experts—that is to say, scientific men—and laymen are in full accord. In a letter received by the author from Prof. John Tyndall a short time before the latter's death, the great authority on physical geography said:

> From your photographs and photo-engravings a better idea of the general aspects of a country is to be obtained than from much reading.

This statement was made with reference to a series of sketch maps of the grand divisions of the earth, made for use in a text-book of geography for school use. A reproduction of one of the models—South America—is presented with this paper.

Mr. Charles D. Walcott, the present director of the United States

Geological Survey, entertains a high opinion of the value of such work. He writes as follows:

> This method of representing the country, if well done, is superior in its graphic effect to the best maps . . . Your models look like the country.

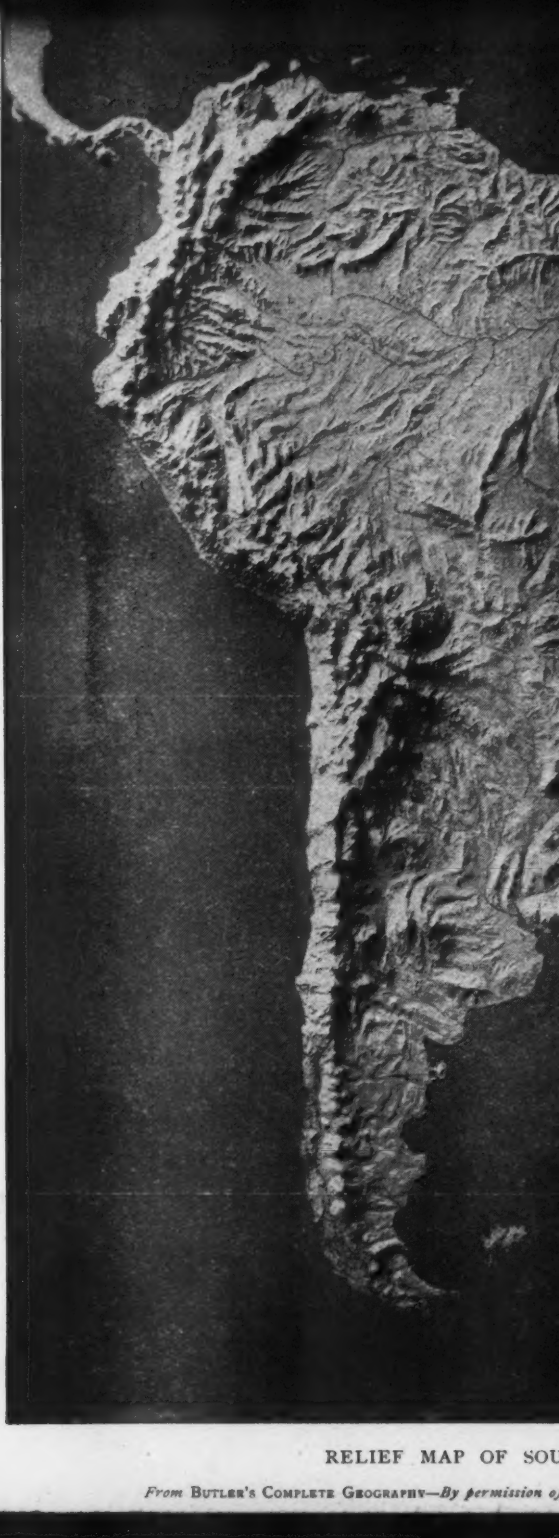
Major J. W. Powell, the former director of the United States Geological Survey, holds similar views, and during his administration of that bureau the largest collection of relief maps in this country, if not in the world, was accumulated. Mr. Henry Gannett, the chief geographer of the Survey, than whom no one is more familiar not only with relief maps but with all other methods of map-making, writes:

> I have made a critical examination of many, if not most, of the models prepared by you. Of the hundred or more such pieces of work that you have turned out I have only words of praise. Your representations of relief are, to my eye, the most expressive and lifelike of any such work that I have seen.

The list might be multiplied indefinitely, but the quotations above are sufficient to show that whatever objections are made to relief maps are applicable only to the results in specific cases and not to the system as a whole. In other words, success or failure is largely a matter of the personality of the author of the model.

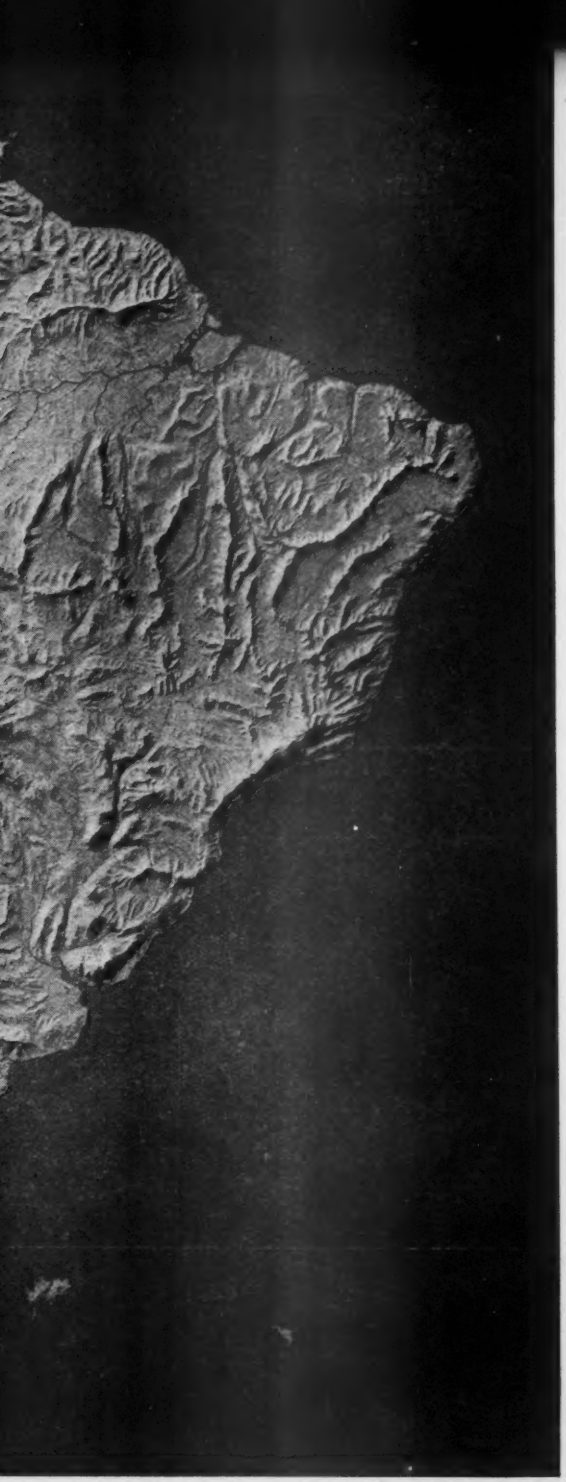
For the purpose of conveying to an untechnical mind an accurate impression of a given section of country no other system can compare with the relief map, and where, as in certain law-suits, it is essential that persons not familiar with maps should have a thorough understanding of topographic details, only a well-made relief map can supply the need, since in no other way—except, perhaps, by personal inspection—can a jury obtain so complete a picture of locality. To the engineer and "promoter" who seek to exploit some great project the relief map affords a means of exhibiting a section of country, and of making clear conditions that otherwise could not be grasped by those who lack technical knowledge. They are of still more value to those who have such knowledge, for they give an impression of the whole, of "the altogether," as it were, which cannot be obtained in any other way, not even by a study of the ground, which must necessarily be taken piecemeal if the area is at all large. For this reason geologists find relief maps particularly valuable, and a large number of those now in existence have been made for the use of scientific men.

As an instance of the widely diverse use of relief maps a case may be mentioned where the area to be pictured was not much larger than an ordinary dwelling-room, and the topography was the most simple, the site being on the side of a gently sloping hill. An



RELIEF MAP OF SOU

From BUTLER'S COMPLETE GEOGRAPHY—*By permission o*



P OF SOUTH AMERICA.

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architect received a commission to improve a cemetery plot, but in working out his plans he encountered two difficulties which seemed insuperable. One was to select the exact thickness and height for a series of sloping walls which would bring them in harmony with the site, and the other was so to plan certain low structures, essential to the project, that they would not come into conflict with the cemetery regulations. He struggled with these problems for some time without making any progress until finally he decided to have a model made. A little relief map, hardly one foot square, removed all the difficulties. It was made to represent, first, the plot as it was; then it was graded and terraced and miniature representations of the walls were put in place, various thicknesses and slopes being tried one after another until the most satisfactory one was found, and finally the model showed the plot as it would be when the improvement was completed. The final model was submitted to the trustees of the cemetery as an exact picture of the plot as it would be, and was accepted by them, although the plans had been rejected previously. The architect then had merely to turn over to his draughtsmen the relief map, which was made very closely to scale, and the working drawings for the grading, stone-cutting and all the other details were made from it. At the same time objections which had been made by neighboring owners, who had believed that their plots would be badly affected by the proposed improvements, were withdrawn at once after an inspection of the little model.

Perhaps the most important use of relief maps is in educational work, although this is only a variation of the general problem, which is to convey an adequate and truthful representation of a section of country to those who have no knowledge of it. For this purpose the model is obviously superior to all other methods, for the simple reason that a relief map is an actual picture, while all other maps are more or less conventional representations, requiring more or less technical knowledge to understand them. An ideal system of teaching geography in schools by the aid of models would not be difficult to devise. Such teaching should proceed from the concrete to the abstract, and should begin with a thorough study of some small area convenient of access. Some well-known hill near-by, or part of one of the city parks, could be modelled on a large scale, and after the scholars became thoroughly familiar with the relief map they could be taken out and introduced to the region itself, if necessary comparing it with the model on the ground. Then the same region could be depicted on maps of various kinds and on different scales, a thorough study of which, in conjunction with the knowledge

already acquired, would give the students a fair idea of what maps mean. Subsequently their mental horizon could be enlarged gradually by the use of models and maps of larger areas—first a county, then a state, afterwards the country as a whole and, finally, a continent. From his personal knowledge of parts the student would retain a lively interest in the whole, and the study of geography would change from its present "dry-as-dust" character to one of the most absorbing subjects in the curriculum. The plan of map-modelling in clay or putty, which is practised in some of the public schools, bears no resemblance to the system sketched above, since it lacks the essential feature of personal interest and personal knowledge of the region depicted.

The ability to read a map—that is, to obtain from a study of it an adequate mental conception of the country depicted—is much more rare than is commonly supposed. The writer has often made the statement that not one person in a thousand understands a contoured map, and he has never been contradicted. On the contrary, one of the best-known geographers in the country, who has supervised the making of hundreds of such maps, said on one occasion that one in ten thousand would be nearer the true figure. Yet with the modern tendency of map-making to the almost exclusive use of the contour system, such knowledge becomes more and more necessary every year. Any project of instruction, therefore, which promises to impart it is worth consideration.

Of the many methods of showing on a map the relief of a country but three have attained any vogue. These are: by hachures, by contours, and by relief maps. In the hachured system relief is shown by shading, more or less conventionalized, the effect being secured by small broken lines. In the majority of examples—indeed, in nine-tenths of the maps of this kind one sees—the system has degenerated into a purely conventional one, the graphic value of the method being lost sight of entirely, and the relief is shown merely by a few pen scratches, with little or no effort to differentiate the kinds of relief. Of such character are most of the maps seen in books as illustrations, of which the best that can be said is that they indicate that there are mountains in the country. In the best examples of hachured work—of which, perhaps, the Dufour maps of the Alps are the most perfect illustration—an attempt is made to represent the country as it would actually appear under given conditions of lighting; that is to say, with the light coming from a certain direction and at a predetermined angle. Obviously this method is an approximation to the relief map; but the result is not nearly so satisfactory,

since its tendency is to exaggerate the minor elements of the relief at the expense of the main features. Moreover, it substitutes an artificial for a natural scale of shadows, and in practice there is no way to distinguish between a mountain 5,000 feet high and one of twice that height. Further, a mountain which rises 500 feet above a plain must be a less pronounced feature on such a map than one which has a height of 1,500, although the former might have an elevation of 12,000 feet above sea-level and the latter only 2,000. In other words, the principal characteristic of hachured work, in its best examples, is to bring out the details of the relief while sacrificing the main features. But the relief map brings out that detail in a much better way, and with a much more natural effect, while preserving the relative relief.

On the other hand, contoured maps sacrifice the graphic element almost entirely in order to exhibit the relative relief. The face of the country is shown by a series of continuous lines, each of which is equidistant, throughout its entire length, from sea-level or some assumed base. Looked at superficially, it would appear that any one should be able to understand a system so simple, for all that is necessary to determine whether one point is higher than another, and how much higher, is to look at the contours. As a matter of fact, however, the system is so purely a conventional one that even long training and much experience do not enable one to determine the character of the relief, although any child could ascertain its amount. So far as it goes, the information such a map gives is clear and definite; and it is doubtless on this account that contours have largely superseded hachures as a means of showing relief on maps. Shading by hachures is now so little used that it may be said, in a general way, that maps made on that system indicate principally a lack of data. When a map-maker does not know whether a certain mountain chain is 1,000 or 10,000 feet high, or whether it is ten miles or a hundred miles long, and has no idea whatever of its width, he naturally prefers to indicate it by a few pen lines, which might mean one or the other of these things. The contour method is essentially a system of quantity of relief, and succeeds in showing that, but at the expense of quality or character.

On contoured maps made on a large scale, with contours of small interval, the lines have some graphic value, as when placed closely together they produce a kind of shading, but usually they serve to show only the relative relief. In a general way it may be said that the hachured system is a qualitative one with a quantitative element, while the contoured system is a quantitative one with a qualitative

element. Relief maps are more graphic than hachures, and surpass contours in showing the relative elevations.

For engineering work, and for many other technical uses where quantity of relief is the main desideratum, contoured maps fill the requirements and are superior to any other. But for general use the system falls far short of being perfect. Similarly, where quality of relief is more important than quantity—as, for example, for the use of the army—hachured maps are more serviceable. The most ambitious work of this character in this country was the War Department survey of the region west of the 100th meridian, designed primarily for the use of the army. That work was discontinued some twenty years ago, and was never resumed, as the present Geological Survey, using the contoured system, replaced it.

In the element of clearness—not the least essential in maps—contoured work has a very decided advantage, since the relief is shown without obscuring other details, such as lettering, drainage, culture, etc. Indeed, in this respect it is much superior to relief maps, the graphic qualities of which are much lessened by the addition of other data. Still, if the model is made with reference to the use to which it is to be put, this disadvantage can be overcome to a large extent, if one bears in mind that strong lines of any kind, other than drainage, have a tendency to destroy relative relief.

Modelling as a method of showing relief should be considered as an elaboration rather than as a rival of the other methods, for in the making of a relief map the first essential is a good hachured or contoured map. The principal use of models must be, therefore, in those cases where the best results are desired, irrespective of comparative cost. Relief maps require a large amount of minute and painstaking labor, of the highly skilled variety, and are, therefore, expensive. The cost per square foot covers a wide range—from $5 to $50—and, to a large extent, is under control, for it depends principally on the character of the work, the purpose for which it is done, and the degree of accuracy which is demanded. A sketch model of a large area on a small scale does not require one-tenth of the time and labor demanded by a relief map of the same area made closely to scale and of the highest degree of accuracy; that is to say, as accurate as the map from which it is made. On such models a day's work might not be more than a section measuring two by three inches, requiring three weeks to the square foot; while in a sketch map, where the permissible error is large, the workman could average over a square foot each day.

Aside from manual skill the prime requisites in the equipment of

a good modeller are a thorough knowledge of topographic form, a wide familiarity with maps and the ability to read them, and a specific knowledge of the region to be modelled; or, failing that, he must possess at least a clear conception of what he seeks to show. Perhaps the best training for a modeller is the actual work of surveying in the field, and the drawing of maps from the instrumental data thus secured. It is hardly reasonable to expect good modelling work from a person who has never seen a mountain chain, and whose knowledge of maps is limited to what can be learned from the printed product; yet many relief maps have been made by such persons. It is not surprising, therefore, that topographic models are not always satisfactory.

The modeller must be an artist as well as a topographer—which is, by the way, rather a rare combination. He must not only know topographic forms, but must have a feeling for them and the ability to give expression to that feeling in a material medium. Theoretically, the topographer without artistic feeling should be able to make a better relief map than the artist without topographic knowledge, for he would know at least what he wanted to do. Practically, however, the artist succeeds better than the topographer, for his trained imagination partly supplies what he lacks, and enables him to form a mental picture of the whole, which it is not difficult for him to incorporate in clay or wax; while in the surveyor's mind there is nothing but an aggregate of detail. Artists differ widely, however, and in many instances it is a case of "all maps look alike to me."

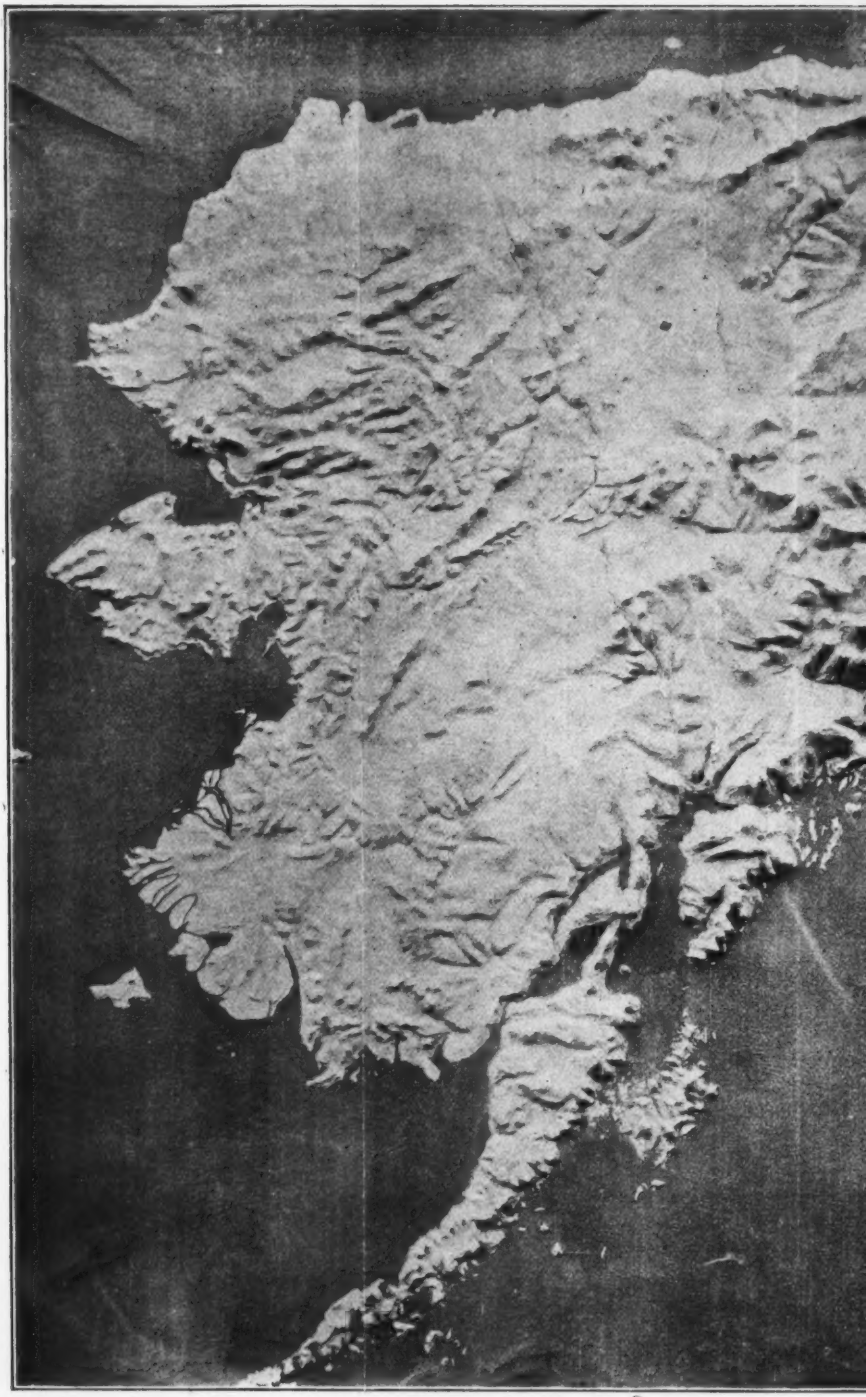
Given an expert modeller and a good contoured map, the procedure of relief map-making is simple. If all the topographic data on the map are to be used, as many copies are made as there are contours: if the maximum elevation is 1,000 feet, for example, and the interval is 100 feet, there would be ten copies. Upon a baseboard representing sea-level, or some other assumed base, one of the maps is mounted, and the others are pasted upon thin wood or cardboard of the exact thickness required by the vertical interval; in the example cited, with a vertical scale of 1,000 feet to an inch, each contour would be one-tenth of an inch. Each cardboard is then placed under a scroll saw, which follows the contour line, all that portion below that level being rejected. Thus the first contour sawed out shows nothing below the 100-foot level but everything above it, including the 200-foot line; the second contour shows nothing below the 200-foot level; and so on. It is then a simple matter to tack the second contour on the first, since its edge

is the same as the 200-foot line, and to continue the process until all the raised contours are in place. At this stage the model should be an exact copy of the contoured map, but with the contours in relief, rising in a series of steps or terraces from sea-level, or the base, to the highest mountain summit. In some instances the model is not carried beyond this stage, but usually this is merely the base upon which the modelling is done.

Up to this point the work is mechanical and can be done by any ordinarily careful person; no knowledge of topography nor skill is required. In the next step, however, these qualities come prominently to the front. Upon the raised contours as a base the modeller fills in the topography with clay or wax, or whatever medium he employs, converting the conventional map into a lifelike representation of the country. Ordinarily he has no other data than the map upon which he works; but if he is competent that is sufficient. Every minute variation in the trend of a contour line and every change in its relations to the lines below and above it mean something; the modeller knows exactly what that meaning is and is able to incorporate it in the wax. He cannot go far wrong, for the contour interval is small—often, indeed, minute; ordinarily less than one-fifth of an inch, and often not more than one-fiftieth.

In other words, to the modeller the raised contoured map is merely a means of control, occupying much the same relation to the finished work that the primary and secondary triangulation do to the map. To fill in the raised contours by connecting their edges by slopes, and calling the result a relief map, is almost as senseless as it would be to fill in the region between the primary triangulation points on the map with straight lines; yet it is often done. The modeller should be able to look through the map and see what the surveyor saw; he must undo the generalizing that was done, and supply the detail which is necessarily omitted in the map or so slightly indicated that it is apparent only on close study. Unless he does this the relief map he makes will be "wooden" and lifeless, and will not be a true representation of the country.

Where the object sought is a graphic representation of a region, accuracy of detail, while important, is not so essential as that broader truthfulness which shows the country as it is, or rather as it appears to be. The point can be illustrated by a reference to the celebrated Muybridge series of photographs of moving animals, which made a sensation many years ago when they were brought out. It was shown, for example, that all the drawings ever made of horses galloping were entirely erroneous; that at no time in the



RELIEF MAP O

EF MAP OF ALASKA.

movement did the horse's feet take the positions shown in the drawings. Thereupon some artists adopted the facts thus determined, using them in their work; but the result was so grotesque that the plan was soon abandoned for a return to the old methods, which showed galloping horses as they appeared and not as they are. Similarly, the difference between a good model and a bad one is the difference between a portrait and a photograph—one shows character, the other exhibits only detail. Where detail is the main desideratum the problem is not so difficult.

When the model is to be reproduced by photography, however, the graphic feature is the dominating element, and the enormous reduction which the model suffers is more than sufficient, usually, to eliminate the result of any liberties that may have been taken with the scale. With a contour interval of one-twentieth of an inch—which is larger than ordinary—only a very careless modeller would run off his scale as much as a contour and a half, even in a sketch model. This would mean about one-fifteenth of an inch on the model, or less than one-fiftieth of an inch on the photograph, with the ordinary reduction; less, usually, than the permissible error on the original map from which the model was made. It will be seen, therefore, that the question of accuracy of detail has been given an undue prominence, and, unfortunately, at the cost of truthful representation in its broader terms. It is so much easier to make an accurate model than to make a relief map that is really a portrait that the former is much more common than the latter.

Another problem closely related to the foregoing is the amount of exaggeration to be given the vertical scale—and on its proper determination depends, to a large degree, the success or failure of the work. Theoretically, a truthful model would have no exaggeration; practically, in very many cases, such a model would show so little that it would be worthless. Unfortunately, the matter of relative vertical scale has been the subject of bitter controversy—principally among scientific men, not among modellers. The latter should know best what is required, and the determination should be left to them, if they are competent. In a general way the scientific man advocates too little exaggeration and the modeller too much.

One well-known chief of a State survey went to the extent of declaring some years ago that, "He that will exaggerate the vertical scale of anything will lie." On the other hand, it is obvious that he who attempts to make a small-scale model of a large area without vertical exaggeration lacks sense. A relief map of the United States, for example, 30 inches long, would have a

vertical scale of over 500,000 feet to an inch; the maximum relief would be about one-thirtieth of an inch, and the general relief in the mountainous districts less than one-fiftieth. In other words, for all practical purposes, there would be no relief at all; the result would not be a relief map. Models have been made, however, in which the mountain peaks looked like church steeples, and a chain of them had the appearance of the teeth of a saw.

One of the principal effects, or defects, of vertical exaggeration is to diminish the apparent size of the region shown. As the relative height of the mountains is increased, the comparative width of the valleys is necessarily diminished. Few persons would realize from a study of a relief map of California, or of any other kind of map, that to the traveller the great valley of that State presents much the same appearance as the plains of Kansas; yet with a proper selection of scales that effect can be suggested in a relief map, if not actually shown.

Where the result desired is a pictorial one—that is, where a graphic representation of the country is wanted—it is the absolute and not the proportionate relief which is important. Whether the horizontal and vertical scales are as 1 to 2, or as 1 to 20, is immaterial. In the sketch map of South America, made for reproduction by photo-engraving in a much-reduced scale, the vertical exaggeration is 25. That would be absurd if applied to other subjects made for other purposes, but in this case the result was satisfactory. On the model itself, which measured about three feet in length, the absolute relief was about three-quarters of an inch, although it looked to be double that. In a general way that amount —from one-half to three-quarters of an inch—may be taken as the proper amount of relief for a model of that character, although in some cases it can be made smaller with advantage.

As an illustration of the scanty knowledge on this subject which is possessed by men who are ordinarily well informed, reference may be made to a bill introduced a few years ago in Congress, providing for the construction of a huge relief map of the United States on one of the public reservations in Washington, close to the Washington Monument. The measure provided for a scale of a square yard to a square mile, which would make three feet to a mile. The amount of ground surface to be modelled would be over 51,000,000 square feet, which, even at 10 cents a foot, instead of $30, which is a fair average price, would cost $5,000,000. The model would be over a mile and a half long and over a mile wide. Without vertical exaggeration, the highest mountains would rise

RELIEF MAP OF NO

AP OF NORTH EASTERN IOWA.

about nine feet above the base, while in the eastern part of the model the greatest height would be less than three feet. That amount would be hardly perceptible in a subject a mile and a half long, although, theoretically, in a model of such large scale no vertical exaggeration should be necessary.

Models of large areas are sometimes made on a curved base, representing a section of the earth's surface. This would doubtless be regarded as essential in such a model as that proposed. The actual curvature of that section of the earth covered by the United States is about 480 miles. Were the proposed model made without vertical exaggeration it would have to be bulged, or rise from the flat, on the scale proposed, 1,440 feet—almost three times the height of the Washington Monument, near-by. With such vertical exaggeration as would be necessary to bring out the relief, the curvature of the model would be very much greater. As a matter of fact, a model 100 feet in diameter would express much more than the vast work proposed, and its cost would be only a minute fraction.

The ability or skill of the modeller is an important element. A good workman can show relief and character in much less space than a poor one finds necessary. A vertical scale of 40,000 feet to an inch, allowing one-fortieth of an inch to each contour interval of 1,000 feet, seems very small, yet it is sufficient to bring out the main features in a small-scale model of a large area. One-fiftieth of an inch can be shown readily, and where the features are well marked, one-sixtieth. On the other hand, in a large-scale model of a region in which the topographic features are not strongly marked—a rolling country, for example—a difference of one-twentieth of an inch is hardly perceptible. It is impossible, therefore, to make any general rule as to the proportion of scales, or even as to the absolute relief required to secure the best result. Each case must be considered and decided by itself.

After the surface of the relief map has been modelled in wax or other material, the further steps in the process depend on the purpose of the work. If designed for photographic reproduction, all that is necessary is to paint the model white, with the drainage and water surfaces in blue. This can be done as well on the wax surface as on a plaster reproduction; and the effect is more satisfactory, for in moulding and casting some of the fine detail is necessarily lost. Indeed, the slight roughness of the wax surface which comes from tooling adds materially to the effect and should be preserved if possible; while the clean, sharp edges of the original work,

which add much to its expressiveness, can be retained only by making the photograph from the wax. The original model, if properly made, is, for all practical purposes, as permanent as a plaster cast, and where only one copy is wanted, is in every respect preferable.

The photographing of models is an art in itself, and many professional photographers fail to secure good results through inability to manipulate the lighting properly. A white-painted model is extremely sensitive to slight changes in the amount and direction of the light, and small variations in these elements make pronounced differences, not only in the general appearance of the model, but also in the amount of the relief shown. In a general way the more oblique the light the more pronounced the relief; yet if the angle be made too small all the detail in the heavy shadows will be lost. This difficulty can be obviated by the use of reflecting screens to light the shadows, as is done in portrait photography. Only by numerous experiments can the best conditions be determined, and those conditions necessarily vary with each subject.

The preparation of the model for photographing is an important preliminary, which has not always received the attention it should have. If the surface is glossy there will be numerous local reflections which will "kill" the relief as effectually as bad lighting; the best finish is that known among painters as an egg-shell gloss. Furthermore, while the model should be white, it should not be a pure white, since in that case the contrast between the high lights and the deep shadows in the photograph is too pronounced. A very slight tinge of yellow—so slight as to be imperceptible to the eye unless compared with a white surface—gives the best result. But these problems are technical ones; enough has been said to show that skill and experience are as necessary in making the photograph as in the earlier stages of the work. The point which it is sought to illustrate is, that with skill and care better results can be secured with relief maps than in any other way, but that competence, knowledge, and attention to detail are essential to success.

As no satisfactory method of duplicating relief maps at small cost has yet been developed, the only available means of reproducing such work that is practicable is by photographic processes. A model, the first cost of which is perhaps $500, and duplicates of which could hardly be made for less than $100 each, could be reproduced by photo-engraving, and if the edition is large enough the maps could be sold at a profit at five cents each. As such

relief maps are immensely superior for many purposes to other kinds of maps which cost more to print than the amount stated, since they are usually in two or three colors, there is no apparent reason why photo-engravings of models should not in time supplant the other methods for many purposes. One thing that has militated against such development is that most of the work done so far has been by amateurs. Should the demand become large enough a class of specialists would be developed, and much better results could be looked for. That such demand will arise eventually seems probable, since there is a consensus of opinion among scientific men and laymen as to the value of relief maps, and none of the difficulties in the way of good results is such that it cannot be overcome by skill and knowledge. One relief map should not be expected to serve two or three conflicting purposes, but the work should be done with especial reference to the end sought, and to that end only. Methods should be subordinated and more attention given to the finished product. In certain classes of scientific work, where the method employed is important, the modeller could be required to state his procedure, as the chemist does. But relief maps should be regarded as artistic and not as scientific products.

It must not be inferred from the absence of descriptions in this article of methods of constructing relief maps, other than by sawing out and building up the contours, that the method given is the only one. On the contrary, their name is legion, and indeed every new piece of work presents problems of its own which must be solved as it progresses. Several pages might be devoted to descriptions of different ways in which models have been made, but the question is purely a technical one. The three relief maps used to illustrate this article were made by three different methods. In the case of South America, concerning which general data are fairly good but detailed geographic information is lacking, contours of various interval were used in the base and the modelling was done with a free hand, with especial reference to a photographic reduction from three feet to less than ten inches. In the map of Alaska, where data are very scanty, the map was mounted on a base board, pins were driven at all points where elevations are known, mostly mountain peaks, and all the intervening region was filled in from the hachured map, most of the information on which was derived from description. In the model of northeastern Iowa the topography, which is of an entirely different character from both of the preceding, was modelled over a carefully made contoured base, and was finished under the personal inspection of a

geologist who was familiar with almost every foot of the ground. The scale also was much larger and the vertical exaggeration less. This model is much more accurate than the other two, but is not so expressive—partly, perhaps, because the region depicted is a rolling or hilly country and not a mountainous one.

LETTER OF M. HENRI FROIDEVAUX.

GEOGRAPHY AT THE UNIVERSAL EXPOSITION IN 1900.—Various writers have attempted to describe the inexhaustible mine of geographical information in the present Exposition, but none have succeeded better than MM. Emmanuel de Margerie and Louis Raveneau. Whoever wishes to study the cartographical portion of the Exposition must read in the *Annales de Géographie* the work of these gentlemen on "Cartography at the Universal Exposition in 1900." It will there be seen that Class 14 of Group III (Maps and Apparatus of Geography and Cosmography. Topography) is far from embracing all the maps at the Exposition.

None the less this Class 14 contains numerous and most interesting documents: the remarkable series of maps of Corsica, exhibited by Prince Roland Bonaparte, which reveal in all its details the cartographical history of the island; the collection of plans of Paris formed by M. Mareuse, and the original notes of cartographers and explorers from the archives of the Société de Géographie, especially attract attention in the historical section (together with an admirable terrestrial globe of the Mercator school, in silver-gilt, belonging to M. le Provost de Launay). To this should be joined, in Class 15, some most interesting old instruments, formerly employed by the geographical engineers during the campaigns of the First Empire, and later by the Officers of the General Staff, for their astronomical and geodetical operations and for topographical surveys.

Extremely interesting,also, are some relief maps exhibited by the Geographical Service of the Army and also by the house of Hachette, whose geographical work is so admirably directed by M. Schrader. Other remarkable reliefs are those of M. J. Chardon (France 1 : 200,000) and M. C. H. Perron (Switzerland, according to the terrestrial curve,on a scale of 1 :100,000). These prove in the clearest manner that even on a small scale it is by no means necessary to exaggerate elevations. Worthy of mention also are M. Imfeld's relief (the Bernese Alps, on a scale of 1 : 25,000; Mont Cervin at 1 : 5,000) and others showing parts of the Swiss territory, the work of M. F. Becker, M. S. Simon and M. A. Heim. Very remarkable, also, are the relief map of the Semmering railway exhibited in the Austrian group, and that of the Yellowstone National Park, the work of Mr. Edwin E.

Howell, who exhibits also a geographico-historical relief of the Island of Manhattan. Very instructive reliefs are those of the State of California by George C. Richards and George Starb; of the Seine Maritime (elevation exaggerated three times) by M. Muret; of Algeria, by M. Molinier-Violle; of Madagascar by M. J. Hansen; and of New Caledonia by Commandant Laporte.

Attention must be called to the hydrographic atlases of the Mekong and of the Niger by the distinguished explorers Simon, Mazeran and Hourst, and to the maps, both printed and manuscript, of many countries (Germany, Austria, Denmark, Japan, the United States, etc.) illustrating the river systems, the mineralogy, the industrial or agricultural resources. From this point of view Russia especially calls for notice; her pedologic exhibition (*pedology* is the name given to the study of the soils) is in every way remarkable, and shows the importance of the science which was in its infancy at the Exposition of 1889. The collection of maps, books and specimens of every kind assembled in Group VII is full of instruction in its patient and minute analysis of the Russian soil as displayed in the fine map on the scale of 1: 2,520,000 by MM. Sibirtzeff, Tanfilieff and Ferkhmine.

A cartographical work of great importance, still in process of completion, is M. Julien Thoulet's lithologic map of the French coasts. The portion exhibited contains twelve maps, which show the character of the soundings along the shore from the bay of Isigny to the estuary of the Gironde.

Mention must be made also of the photographic collections illustrating the forms of the surface, the meteorology, the flora and fauna, the anthropology and the ethnography of all parts of the world, without omitting the extremely fine photographs of clouds, made in the United States by Messrs. A. J. Henry and A. McAdie, and in France by M. Alfred Angot, and the interesting exhibit of the Club Alpin. Of mountain photographs none is more magnificent than Vittorio Sella's Mt. St. Elias.

Not the least impressive among these endless collections are the photographs of Algeria—veritable topographic documents—which bring out the intensity of the erosion in this country, where sudden and violent downpours of water follow on long drouths, and the vegetation is too sparse to afford serious protection to the soil.

Of the panoramas exhibited unusual interest attaches to that of the Trans-Siberian Railway, executed in the most conscientious manner by Dr. Piassetski, and the superb panorama of Mont Blanc, by M. Fr. Schrader. The point of view in the latter is from the

glacier des Périades, on the side of the Tacul, at an elevation of more than 9,000 feet.

In the Canadian exhibit, the mineral riches of the Dominion are displayed as far as possible in the order of the Provinces, the place of honor naturally falling to the gold region of the Klondike. Other auriferous countries display their wealth; West Australia leading the way with an exhibit of gold nuggets to the value of more than 500,000 dollars. But the most complete mineral exhibit, without question, is the systematic collection of the minerals of the United States, according to Dana's classification, brought together by the combined efforts of eight universities.

In the midst of the crowds and the excitement of the Exposition the return of M. Fernand Foureau passed almost without notice, and there were few persons at the Lyons station to greet the explorer, who had just crossed the Sahara from the south of Algeria to Lake Tchad, and had returned to France by way of the Gulf of Guinea. In a future letter, after hearing M. Foureau's report to the Société de Géographie, I shall set down the principal scientific results of his journey.

Here it is interesting to record that the "Military Territory of the Countries and Protectorates of the Tchad" has received a definitive organization. It is constituted by the basins of the Kemo and the Shari; it begins on the Ubanghi, at the confluence of the Kemo with the great affluent of the Congo, and it is bounded on the north by the shores of Lake Tchad. From Goulfeï to Fort Archambault, along the line of defence of the Shari, will be stationed the infantry charged with the protection of the Territory, while it is proposed to quarter the cavalry and artillery at Massenia.

A treaty, recently signed, puts an end to the questions of boundary which had arisen between Spain and France in Africa. In the Western Sahara, France keeps the Adrar and the Sebkha d'Idjil, and this disposes of the question of the Rio de Oro; while to the north of the French Congo, France reserves a right of preëmption on the Spanish territory, comprised between the German frontier of the Kamerun and a line drawn from the mouth of the River Muni to the ninth degree of longitude, west from Paris.

Of geographical publications in these recent months there is not much to note, but I must mention the second volume of the French translation of Suess's *Das Antlitz der Erde*, executed under the direction of M. Emm. de Margerie, with a conscientious care that cannot be too highly praised.

The Ministry of Public Instruction has issued the account of the travels of Captain Cupet in Laos, and among the savages of south-eastern Indo-China. This work forms Vol. III. of the section "Géographie et Voyages" in the series of the Pavie mission. It is very attractive, and is accompanied by excellent maps.

A special place must be reserved for the work of Mgr. Alph. Favier, Vicar Apostolic of Peking, on that great city. In this volume, which bears the title: *Péking. Histoire et Description*, the eminent author gives a most interesting account of the history and the life of the capital of the vast Asiatic empire, under its every aspect, and has produced a work to be read and to be kept for its permanent value.

Paris, September, 1900.

NOTES AND NEWS.

THE U. S. GEOLOGICAL SURVEY has published Water-Supply Papers, Nos. 35 to 39, giving results of measurements of rivers and observations of height.

No. 35 is devoted to the rivers flowing into the Atlantic, from Maine to Virginia.

No. 36 to the rivers flowing into the Atlantic, south of Virginia.

No. 37 to the rivers flowing from the eastern Rocky Mountain area.

No. 38 to the rivers tributary to the Colorado, the Interior Basin and the Columbia River.

No. 39 to the California rivers, and to the rating tables for various river stations described in Nos. 35 to 39, inclusive.

Application for the Papers should be made to Members of Congress, or to the Director of the U. S. Geological Survey, Washington, D. C.

IT IS ANNOUNCED that the first meeting of the International Seismological Society, formed in accordance with a decision of the Seventh International Geographical Congress, will be held at Strassburg, April 11, 1901.

MR. MARSHALL H. SAVILLE, of the American Museum of Natural History, will start for Mexico early in November to continue the excavations begun two years ago in the State of Oaxaca, and increase, so far as possible, the collections illustrating the culture of the Zapotecans.

THE LONDON *Athenæum*, of September 22, prints the following communication on the subject of the Hereford Map:

> The recent attacks on the authorities for neglect of this interesting map are undeserved, and the defence of the Dean complete. I have this week carefully inspected it, from the Holy Trinity at the top to the mermaid in the centre and thence to the devil at the bottom, *viâ* two Babylons, London and Salzburg. It is in perfect preservation and well watched over.—READER.

THE EDITION of the Jesuit Relations and Allied Documents in the original texts, with English translations and notes, begun by the Burrows Brothers Company in 1896, is practically finished, as appears by the following announcement on page 17 of Vol. LXX:

Vol. LXXI will contain the remainder of the text of our series. The Index will occupy Vols. LXXII and LXXIII.

The publishers are to be congratulated on the completion of a worthy enterprise.

ACCORDING TO THE REPORT of the Division of Forestry (U. S. Department of Agriculture) on the Big Trees of California, there are ten groups of these scattered along the west side of the Sierra Nevada, from the middle fork of the American River to the head of Dèer Creek, a distance of two hundred and fifty miles.

The finest of all, the Calaveras Grove, with the biggest and tallest trees, came in April last into the possession of a lumberman, and the Mariposa Grove is the only one which can be regarded as safe from destruction.

The Report discusses the age of the Big Trees, and seems to find no difficulty in admitting that they have stood for five thousand years.

A writer in *Science* (Oct. 12, 1900) states that he once counted with much care the rings of growth of a tree which was felled in 1853.* The count was made from circumference to centre, and every ring was counted, no guess being made. There were 1147 rings, and the writer concludes that the tree was eleven hundred and forty-seven years old. He doubts—and with reason—whether any one of the existing Big Trees approaches the age of two thousand years.

Great antiquity has been ascribed to many trees—to the dragon-tree of Orotava,† the great chestnut on Mount Etna, the cedars of Lebanon, the Tasmanian eucalyptus, the baobabs of Senegal—but the estimate in every case is matter of conjecture. So far as historical records show, the oldest tree in the world is the famous Bo tree (*Ficus religiosa*) of Anuradhapura, in Ceylon. This was a branch of the tree under which Sakya-Muni became a Buddha, brought to Ceylon and planted there in the year 288 B.C. Sir J. Emerson Tennent cites, in his work on Ceylon, twenty-five texts which trace the biography of this sacred tree from the year of its planting down to the year 1739.

In a recent communication to the Académie Royale de Belgique,

* This tree belonged to the Calaveras Grove, and its stump forms the floor of the so-called dancing pavilion. Its circumference is ninety-two feet, and the tree was three hundred feet in height.—(Hittel's *Resources of California*, p. 82.)

† This tree, which Humboldt regarded a hundred years ago as one of the oldest organisms on the globe, was nearly destroyed by a hurricane in 1868, and has since perished.

M. Jules Leclercq recounts the history and describes *de visu* the present condition of the bo tree. Its branches spread beyond the enclosure in which it stands and are supported by solid props, while the trunk is held up by masonry built against it as a kind of pyramid, which is raised higher from century to century. At the base are altars, on which the pilgrims lay their offerings of flowers.

CAPT. JOHN WALL WILSON, the last survivor but one of the Kane Arctic Expedition, died on the 21st of August.

THE BUFFALO SOCIETY OF NATURAL SCIENCES announces the decease, on August the 21st, at the age of seventy-one years, of David F. Day, a charter member of the Society, who served as its President and was for forty years its Botanist and one of its Directors.

BOOK NOTICES.

Tarr and McMurry's Geographies. First Book, Home Geography and the Earth as a Whole, 12mo, 279 pp. Second Book, North America, 12mo, 469 pp. : The Macmillan Company.

These volumes, by Professors Tarr of Cornell University and McMurry of the Teachers College, Columbia University, belong to a series of three text-books for grade schools, of which the third is to deal with Europe and the other continents. In the First Book 110 pages are devoted to home geography. The section topics are: Soil, hills, mountains, valleys, rivers, ponds and lakes, the ocean, the air, industry and commerce, government, and maps. It is urged that home geography should receive more attention, because geographic study must be based on experience. Thus only is the student prepared for advanced work.

The worthy attempt of the authors in this part of the volume brings out the intrinsic difficulty of preparing a general text-book of home geography. The principles of this phase of geographic education can be worked out, but they must be applied in detail by teachers on their own ground. The matter of home geography varies with every environment. The first eight sections furnish a simple and interesting treatment of elementary physiography, but they are not strictly home geography. The teacher and pupil may, however, derive from them much suggestion fruitful for such work. Professor R. E. Dodge has given, in the Journal of School Geography (Sept., 1900), a course in home geography adapted to New York City—an outline which adequately reflects the nature of such work.

Taking the book as a whole, there is little to criticise and much to commend. The aim at a juvenile style is perhaps too apparent in some passages, while in a few cases topics are introduced for which the preparation or age of the student is scarcely adequate. Figs. 17 and 30 are in point, in which the broad and generalized foldings convey an erroneous notion of mountain-making and of elevations of the land. Similarly formal and misleading is the illustration of valleys and divides, p. 29. A few of the cuts are too much reduced to have teaching value, as Figs. 117 and 176. But this is a common fault of text-books, and for the most part the illustrations in this are attractive and admirable. The maps are good in their expression and in their omission of details.

In the second part of the First Book we find Form and Size of the Earth, Zones, Heat within the Earth, Continents and Oceans, North America, the United States, and a brief account of other continents. The space is well proportioned. The United States are grouped as New England, Middle Atlantic States, including Maryland and the Virginias, Southern, Central and Western States.

We may take the Central States as showing the method of treatment. We find a good general map in color, an outline map of the wheat-producing States of the entire country, also of the chief cattle-raising districts. The pictorial illustrations include a harvesting view, a cattle farm, the Mesabi ore pits, Market Street in Chicago, cattle in the stock yards, and St. Anthony's Falls as affording mill-power. The causal principle is remembered throughout and illustrated in the industries of States, and the location and development of cities—for example, Chicago, Duluth, Minneapolis, and others. All this is in the compass of nine pages.

There are in the various chapters suggestions for what might be called laboratory exercises, and for collecting specimens, as iron ore, hard and soft coal, various rocks and grains. Visits are suggested, as to fish markets in New England and to manufacturing establishments. This, it may be remarked, is the way in which the home geography of the book most effectively comes in. A distinct advantage is rightfully claimed for the convenient size of the volume. A good list of reference books is added and a statistical appendix.

The excellence and variety of the maps are a feature of the Second Book. Besides the colored political maps we find an admirable series of nine reliefs from Howell's models. These include North America, the continental ice-sheet, two showing the United States (one carrying the names of physiographic regions) and the several groups of States. There are maps of the greater cities and a variety of meteorological charts. Among other maps we note those of Standard Time belts, the Fall Line, the Erie Canal, navigable rivers, railways, and several giving the distribution of agriculture and mining operations.

About one-fourth of the volume is occupied with a general geographical introduction, and the rest deals specifically with North America. The United States occupy 257 pages, and the treatment deserves the highest praise. Such a volume must command the student's attention and give him a generous knowledge of his own country.

We may take again the Central States. The nine pages of the First Book are here expanded to forty-seven. Several paragraphs

give a simple narrative of the settlement of the Mississippi Valley. A good description of a farm in central Ohio helps to put the agriculture of the region into the concrete, and is a great advance upon the bare catalogues of products, of many geographies. Fruit-raising in a climate tempered by the great lakes affords one of the illustrations of causal geography which abound. Somewhat full accounts are given of wheat, corn, cattle ranching, lumbering, petroleum and natural gas and various minerals, especially iron. The treatment of Chicago is expanded to five pages, with proportionate accounts of the other great cities of the Central States.

Countries north and south of the United States follow with a concluding chapter, which summarizes and reviews the whole with maps and diagrammatic views of various industries. The authors have made a good contribution to educational geography, and the two volumes, with several other text-books of recent years, set forth the spirit and method of the new geography. A. P. B.

Through the First Antarctic Night, 1898–1899. A Narrative of the Voyage of the "Belgica" among newly discovered Lands and over an unknown Sea about the South Pole. By Frederick A. Cook, M.D., Surgeon and Anthropologist of the Belgian Antarctic Expedition. With an Appendix containing a Summary of the Scientific Results. Illustrated. New York, Doubleday & McClure Co., 1900. 8vo.

Dr. Cook says very truly, in his Introduction, that the credit of organizing the Belgian Antarctic Expedition belongs to its commander, Adrien de Gerlache, and that the voyage of the *Belgica* marks the beginning of a third revival of Antarctic exploration, in which the place of honour belongs, not to England nor to Germany, but to Belgium.

Full information on the results of the expedition is not to be expected for two or three years, but a summary by M. Emile Racovitza was published in *La Géographie*, No. 2, 1900. *

Dr. Cook boarded the *Belgica* in the harbour of Rio de Janeiro and then met for the first time the associates—Belgian, Norwegian, Russian and Rumanian—with whom he was to live for more than a year. The ship he found to be well built for her service and well equipped in every way.

In Beagle Channel Dr. Cook was able to observe the Fuegian tribes and study their way of life. There are three of these tribes—

* This summary will be found in the Society's BULLETIN, No. 3, 1900, page 270.

the Alaculufs, the Yahgans and the Onas,—all reduced in number and the first two nearly extinct. The Onas, a race of giants, have so far refused to be civilised, and have kept themselves aloof from the white men. These, however, are steadily widening the area of their sheep farms and are pushing the Onas into the hills and mountains in the interior.

In stature the Ona men average nearly six feet, and their physical development is perfect. The women are not so tall, and they are somewhat corpulent.

The whole race numbers about sixteen hundred, divided into sixteen tribes, all dwindling away. They live by the chase in the hunting grounds still left to them, and by plundering the sheep farms.

Their ingenuity exhausts itself in making their weapons, and they go almost without clothing or shelter. Their bows are made of the wood of the Antarctic beech; the arrows of the reed-like branch of a tree called the Winter's bark, winged with bird feathers and tipped with glass.

The hut—if it can be so called—is made of a few branches and skins, forming a breastwork against the wind. At night the fire is allowed to go out, the children are put in the middle of a circle with the adults outside, and guanaco skins are drawn over all. Formerly their dogs slept on top of the Ona family and kept them warm; but the dogs have been killed off by the sheep farmers.

From Tierra del Fuego the ship made her way into the icy southern ocean.

Once fast in the ice the explorers took up the round of duties and amusements which enable men to live through their imprisonment in the polar wildernesses. Dr. Cook writes of these in a direct and interesting way, while he misses none of the strange effects of light and colour in the panorama before him.

The illustrations of this handsome volume were nearly all made from photographs, and the author gives expression to his surprise at the success attained in the reproduction of the coloured views.

ACCESSIONS TO THE LIBRARY.

JULY–OCTOBER, 1900.

BY PURCHASE.

The Annual Cyclopædia, 1899 (Appleton), New York, 1900, 8vo; Dictionary of National Biography, edited by Sidney Lee, Vol. LXIII, London, 1900, 8vo; The Voyage of Robert Dudley, etc., to the West Indies, edited by George F. Warner, London, 1899, 8vo (Hakluyt Society, 2d Series, No. III); The Journey of William of Rubruck to the Eastern Parts of the World, etc., translated by William W. Rockhill, London, 1900, 8vo (Hakluyt Society, 2d Series, No. IV); Un Outre-Mer au XVII Siècle, Voyages, etc., du Baron de La Hontan, Notes, etc., par François de Nion, Paris, 1900, 16mo; La Conquête de L'Afrique, par Jean Darcy, Paris, 1900, 16mo; Vie de Samuel Champlain, par Gabriel Gravier, Paris, 1900, 4to; Overland to China, by A. R. Colquhoun, New York and London, 1900, 8vo; The Mississippi Valley in the Civil War, by John Fiske, Boston and New York, 1900, 8vo; The Colombian and Venezuelan Republics, by William L. Scruggs, Boston and New York, 1900, 8vo; The Pilgrims in their Three Homes, by William Elliot Griffis, Boston and New York, 1898, 16mo; Appleton's Dictionary of New York and its Vicinity, New York, 1900, 12mo; China, the Long-Lived Empire, by Eliza Ruhamah Scidmore, New York, 1900, 8vo; Colonial Civil Service, by A. Lawrence Lowell, New York, 1900, 8vo; World Politics at the End of the Nineteenth Century, by Paul S. Reinsch, New York, 1900, 8vo; The Welsh People, by John Rhys and David Brynmor-Jones, New York, 1900, 8vo; Three Episodes of Massachusetts History, by Charles Francis Adams, Boston and New York, 1894–96, 2 vols., 8vo; Massachusetts, its Historians and Its History, by Charles Francis Adams, Boston and New York, 1898, 8vo; Vermont, by Rowland E. Robinson, Boston and New York, 1900, 8vo; Out of the East, by Lafcadio Hearn, Boston and New York, 1900, 8vo; Water Supply of Rome by Sextus Julius Frontinus, by Clemens Herschel, Boston, 1899, 4to; Letters received by the East India Company from Its Servants in the East, Vol. IV, edited by William Foster, London, 1900, 8vo; Map of China and Surrounding Regions, by E. Bretschneider, 2d Edition, St. Petersburg, 1900, 4 sheets; Stanford's Map of Eastern China, Japan and Korea, London, 1900, 1 sheet; China in Decay, by A. Krausse, Revised Edition, London, 1900, 8vo; Japan in Transition, by Stafford Ransome, London, 1899, 8vo; A Diplomatist's Wife in Japan, by Mrs. Hugh Fraser, 2d Edition, London, 1899, 2 vols., 8vo; Russia on the Pacific and the Siberian Railway, by "Vladimir," London, 1899, 8vo; The Silver Map of the World, by Miller Christy, London, 1900, 8vo; A Briefe and True Report of the New Found Land of Virginia, by Thomas Hariot, London, 1900, 4to; Thomas Hariot, the Mathematician, etc., by Henry Stevens, London, 1900, 4to; The Jesuit Relations and Allied Documents, edited by Reuben Gold Thwaites, Vols. LXVII–LXX, Cleveland, 1900, 8vo; Sir Stamford Raffles, by Hugh Edward Egerton, New York, 1900, 8vo; Ethnographical Album of the North Pacific Coasts, Part I, American Museum of Natural History, New York, 1900; Life on the Bosphorus, by W. J. J. Spry, London, 1895, 8vo; Three Years in Western China, by Alexander Hosie, London, 1890, 8vo; The Kilima-Njaro Expedition, by H. H. Johnston, London, 1886, 8vo; Through the Gold Fields of Alaska, by Harry De Windt, New York and London, 1898, 8vo; Fragments des Poëmes Géographiques de Scymnus de Chio, etc., publiés par J. A. Letronne, Paris, 1840, 8vo; Historia del Almirante de las Indias, Don Cristóbal Colon, por Fernando Colon, Madrid,

1892, 2 vols., 16mo; Conversión en Piritú (Colombia), por Ruiz Blanco, Madrid, 1892, 16mo; Milicia y Descripción de las Indias, por Bernardo de Vargas Machuca, Madrid, 1892, 2 vols., 16mo; Virtudes del Indio, por Juan de Palafox y Mendoza, Madrid, 1893, 16mo; Tres Tratados de América (Siglo XVIII), Madrid, 1894, 16mo; Relâción Historial de Indios del Paraguay, por P. J. Patricio Fernandez, Madrid, 1895, 2 vols., 16mo; Repúblicas de Indias, Idolatrias y Gobierno, por Fr. Jerónimo Roman y Zamora, Madrid, 1897, 2 vols., 16mo; Ruiz Montoya en Indias, por Dr. D. Francisco Jarque, Madrid, 1900, 4 vols., 8vo; Bibliografía Española de las Islas Filipinas (1523–1810), por J. T. Medina, Santiago de Chile, 1898, 8vo; Memoria Descriptiva é Historica de las Islas Marianas, por F. de La Corte y Ruano Calderon, Madrid, 1875, 8vo; Journal du Voyage fait par ordre du Roi à l'Équateur, etc., par M. de La Condamine, à Paris, 1751, 4to; La Pacification de Madagascar, par F. Hellot, Paris, 1900, 8vo; Histoire de la Géographie de Madagascar, par Alfred Grandidier, Paris, 1885, 4to; Vingt Ans à Madagascar d'après les Notes du P. Abinal, par le P. de la Vaissière, Paris, 1885, 8vo; Vom Mittelmeer zum Persischen Golf, von Max Fr. von Oppenheim, *Band 2*, Berlin, 1900, 8vo; Der Kilimandjaro, Reisen und Studien, von Dr. Hans Meyer, Berlin, 1900, 8vo; Mission Scientifique dans la Haute Asie, 1890–1895, J.-L. Dutreuil de Rhins, Paris, 1897–1898, 3 tomes, 4to; La Province Chinoise de Yün-Nan, par Émile Rocher, Paris, 1879, 2 tomes, 8vo; Tales of Old Japan, by A. B. Mitford, 2 vols. in 1, London, 1871, 8vo; Physical Geology and Geography of Great Britain, by A. G. Ramsay, London, 1894, 8vo; Invasion of India by Alexander the Great, by J. W. M'Crindle, Westminster, 1896, 8vo; Journey in the Seaboard Slave States, by Frederick Law Olmsted, London, 1856, 8vo; Letters from the Slave States, by James Sterling, London, 1857, 8vo; The Story of Florence, by Edmund G. Gardner, London, 1900, 16mo; The Attaché at Peking, by A. B. Freeman-Mitford, London, 1900, 8vo; Russia against India, by A. R. Colquhoun, New York and London, 1900, 8vo; The Antarctic Regions, by Karl Fricker, London, 1900, 8vo; The Ascent of Mount St. Elias by H. R. H. Prince Luigi Amadeo di Savoia, Duke of the Abruzzi, narrated by Filippo de Filippi, Westminster, 1900, 8vo; The Redemption of Egypt, by W. Basil Worsfold, London, 1899, 8vo; In the Valley of the Rhone, by Charles W. Wood, London, 1900, 8vo; The Colonization of Africa by Alien Races, by H. H. Johnston, Cambridge, 1899, 8vo; Man, Past and Present, by A. H. Keane, Cambridge, 1899, 8vo; Ethnology, by A. H. Keane, 2d Edition, Cambridge, 1896, 8vo; Outlines of Military Geography, by T. Miller Maguire, Cambridge, 1899, 8vo; History of Ancient Geography, by H. F. Tozer, Cambridge, 1897, 8vo; Correspondence relating to the Condition of the Pitcairn Islanders, London, 1899, folio; Description Hydrographique et Historique des Marais Pontins, par M. de Prony, à Paris, 1822, 4to, et Atlas, 1823, folio; The Dolomite Mountains, by J. Gilbert and G. C. Churchill, London, 1864, 8vo; Five Years' Experience in Australia Felix, by G. H. Haydon, London, 1846, 8vo; Records of the City of New Amsterdam in New Netherland, edited by Henry B. Dawson, Vol. I (all published), Morrisania, N. Y., 1867, 8vo, paper.

GIFTS.

From Armand Colin & Cie, Publishers, Paris:

La Face de la Terre, par Ed. Suess, tr. par Emm. de Margerie, *Tome II*, Paris, 1900, 8°.

From Frederick A. Cook, Author:

Through the First Antarctic Night, 1898–1899, New York, 1900, 8°.

From William Morris Davis, Author:

Glacial Erosion in France, Switzerland and Norway (*Reprint from Proceedings*

Boston Society of Natural History, Vol. 29, No. 14), Boston, 1900; Glacial Erosion in the Valley of the Ticino (*Extract from Appalachia, Vol. IX, No. 2, March, 1900*); The Freshwater Tertiary Formations of the Rocky Mountain Region (*Extract from Proceedings of the American Academy of Arts and Sciences, Vol. XXXV, No. 17, March, 1900*); The Physical Geography of the Lands (*Reprinted from Popular Science Monthly, Vol. LVII, No. 2, June, 1900*); Balze per Faglia nei Monti Lepini, traduzione di Fr. M. Pasanisi, Roma, 1899.

From Mrs. J. Haven Emerson:

Black's General Atlas, Edinburgh, 1841, folio.

From Dr. J. Haven Emerson:

The following maps: Postcurs von Deutschland, Beutlingen, s. a.; Greece, N. & S. S. Jocelyn, New Haven, 1824; Italien, C. F. Weiland, Weimar, 1821; City of Dublin, Wilson's Directory, 1800; Pianta Litorale, Regno di Napoli fino a Pesto, N. Gervasi, Napoli, s. a.; General Charte von Schweiz, C. F. Weiland, Weimar, 1821 (2 copies); Pays-Bas, Ferra ainé, Bruxelles, 1819; London, John Dower, London, 1862; London, Samuel Leigh, London, s. a.; New York, W. Bradford (facsimile), New York, 1834.

From Max Fleiuss, Author:

Os Centenarios do Brazil, Rio de Janeiro, 1900, 8°.

From Alejandro Gancedo, Author:

Canal Navegable de Santiago del Estero al Rio Paraná, Buenos Aires, 1900, 8°.

From Wm. Paul Gerhard, C.E.:

Second Report of the U. S. Board on Geographic Names, 1890–1899, Washington, 1900, 8°.

From Thomas Jefferson Hurley, Author:

Famous Gold Nuggets of the World, s. l., 1900, 16°.

From Jules Leclercq, Author:

L'Indépendance des Boers et les Origines des Républiques Sud-Africaines. (Extrait de la Revue des Deux Mondes du 1er Juin, 1900), Bruxelles, 8°.

From The Macmillan Co., New York:

Tarr and McMurry's Geographies, 2d Book: North America, by R. S. Tarr and F. M. McMurry, New York, 1900, 16°.

From Cl. Madrolle, Author:

Hai-Nan et la Côte Continentale Voisine, Paris, 1900, 8°.

From the New York Produce Exchange:

Report of the New York Produce Exchange, 1899–1900, New York, 1900, 8°.

From Manuel M. de Peralta, Author:

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From E. A. Tredwell:

The following maps: S. E. Coast of the United States and the British West India Colonies, New York, s. a.; City of New York, N. Y., s. a.; Chile, B. Vicuña Mackenna, New York, 1866; Map and History of Cuba, by Lieut. E. Hannaford, Springfield, Ohio, 1897; Cyclist's Road Map of New York, 6 sheets, New York, 1893; Bradshaw's Railroad Map of Europe, s. l., s. a.; Andrews' Report on Lake Trade Maps, 1855; Twelve magazine and newspaper maps of Sahara R.R., Mississippi Delta, Great American Desert, etc.

From Edward Whymper, Author:

Scrambles amongst the Alps in the Years 1860–1869, 5th Edition, London, 1900, 8°.

THE SOCIETY'S HOUSE ON MANHATTAN SQUARE.

In presenting to the Fellows the accompanying illustrations of the Society's house, now in process of construction in West Eighty-first Street, on Manhattan Square, it is proper to acknowledge, with thanks, subscriptions to the Building Fund received during the summer to the amount of $2,455.00. Including these, the whole amount thus far received from Fellows of the Society in response to the circular letter issued by the Council in February, 1899, is $32,-155.00, contributed as follows:

John D. Archbold	$1,000.00
Herman C. Armour	1,000.00
Francis M. Bacon	1,000.00
W. J. Bormay	5.00
Chas. P. Daly	5,000.00
D. Stuart Dodge	200.00
James Douglas	250.00
William A. Du Bois	250.00
James B. Ford	2,500.00
John Greenough	1,000.00
John A. Hadden	1,000.00
James J. Higginson	350.00
James J. Hill	200.00
E. A. Hoffman	250.00
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Gustav E. Kissel	1,000.00
Joseph Loth	250.00
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D. O. Mills	5,000.00
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Chandler Robbins	1,500.00
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Herman C. von Post	1,000.00
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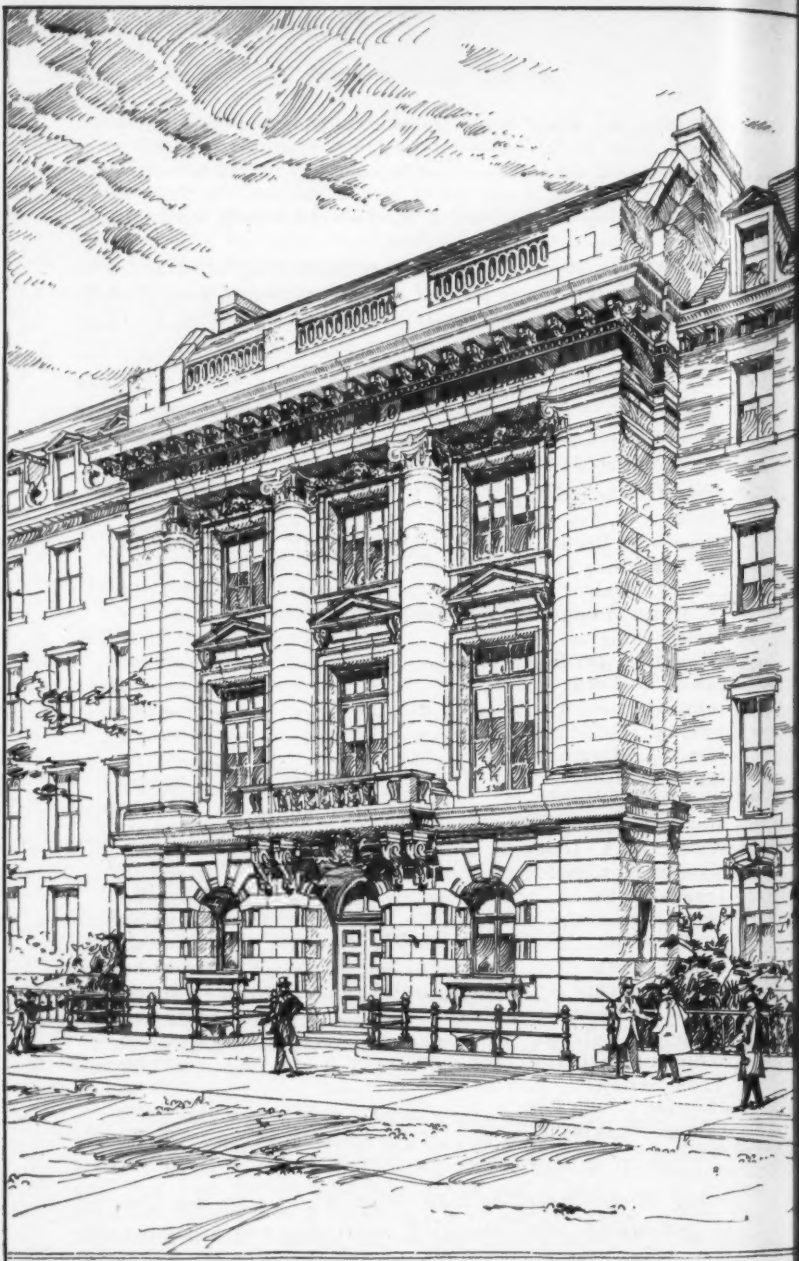
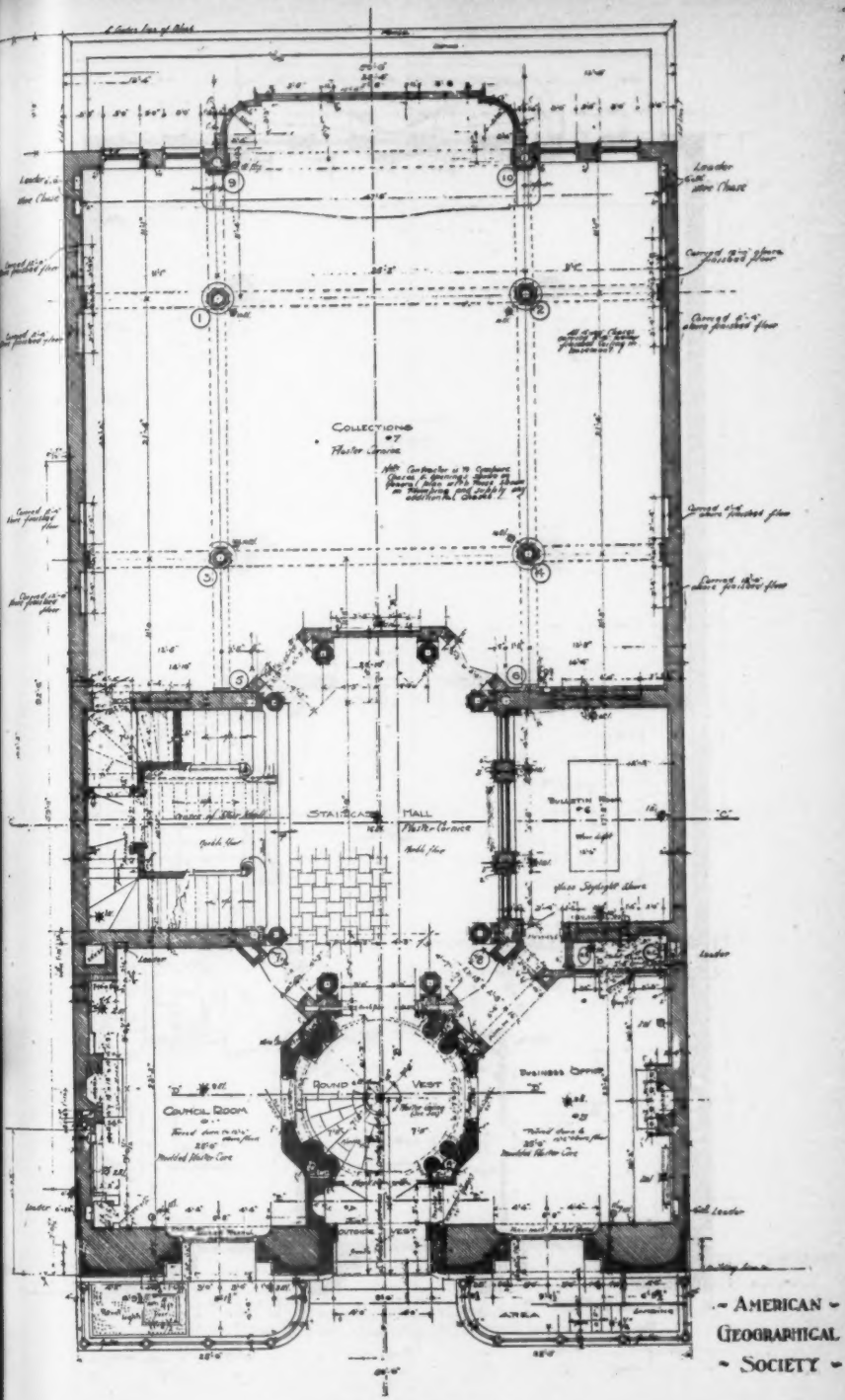
Owing to the prevailing high values of materials and labor the house and fittings will cost much more than was originally contemplated, and further contributions to the Building Fund are much needed and will be welcome.



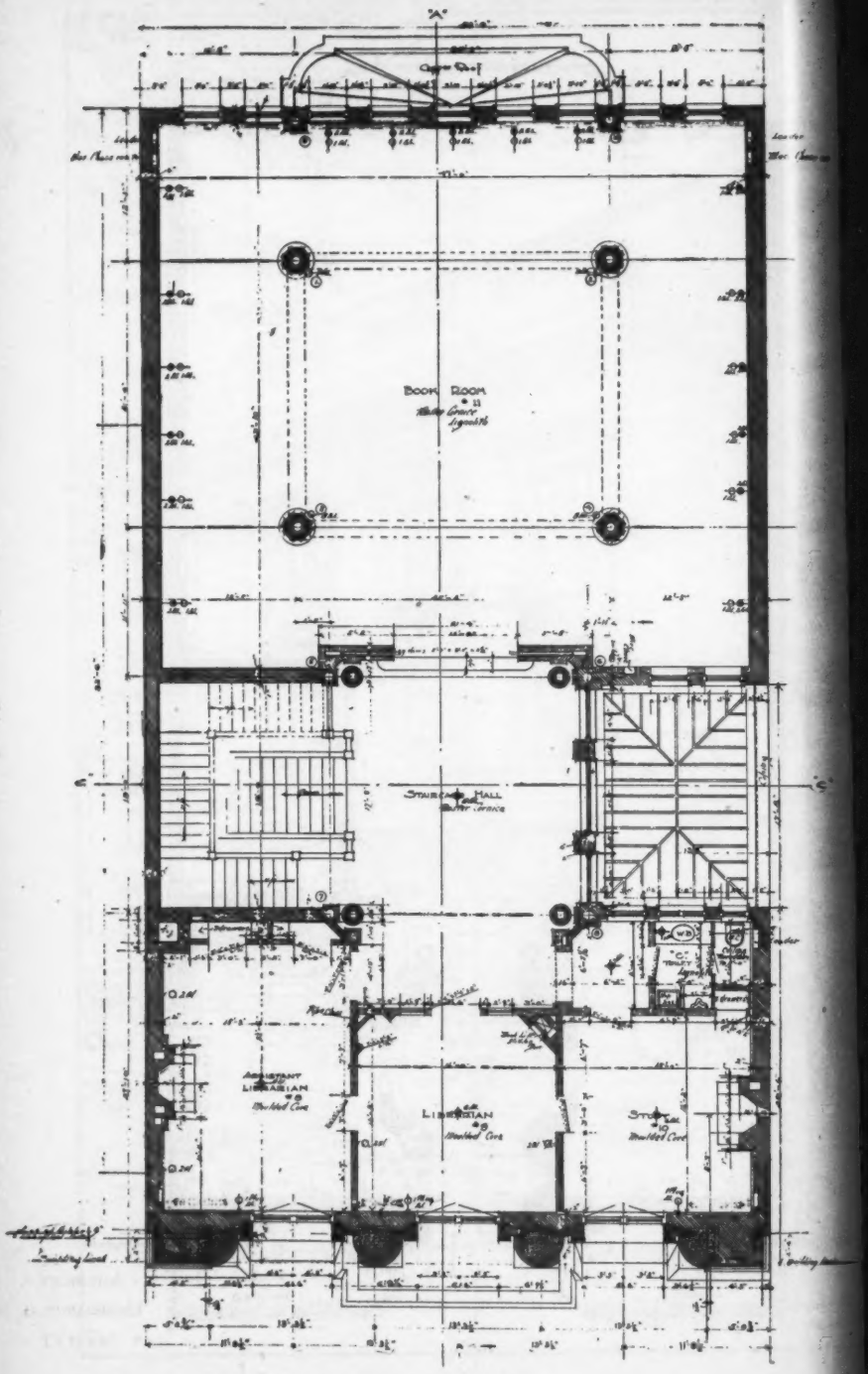
·SKETCH· OF · THE·NEW · BUILDING · FOR · THE·

AMERICAN · GEOGRAPHICAL · SOCIETY·

·HOWELLS·&·STOKES·
·ARCH·
·47 CEDAR·ST·N·Y·


COLLECTIONS OF
Plaster Casts
STAIRCASE
MALL
Plaster Cornice
ROUND
VEST
COUNCIL ROOM
BUSINESS OFFICE
AREA
AMERICAN
GEOGRAPHICAL
SOCIETY

FIRST FLOOR.



LIBRARY FLOOR.


I. SAN BENITO
I. CERROS
B. Sur
I. NATIVIDAD
P. Morro Redondo
BAHIA
SEBASTIAN VISCAINO
P. Cabeza del Caballo
B. Falsa
B. Playa Maria
P. Negra
P. Rosalia
B. Sta. Rosalia
P. San Eugenio
P. Rompiente
P. San Bartolome
Morro Hermoso
Ojo de Liebre
Salinas
Sto. Domingo
Manuela Lagoon
Black Warrior
Lagoon
Llanos de
Berrendo
P
A
C
I
F
I
C
B. San Cristobal
Arr. Los Algodones
P. San Pablo
B. San Pablo
P. San Roque
B. San Roque
I. ASUNCION
B. Asuncion
SIERRA PINTADA
CERRO PRIETO
SIERRA DE SANTA CLARA
P. San Hipolito
B. San Hipolito
San Lorenzo
Sta. Clara
Estero
El Coyote
Estero
El Rancho
P. Abreojos
B.
Ballenas
Arr. Patrocinio
San Jose de Gracias
P. Santa Rosa
Cadeje
San Juanico
Pta. Pequeña
B. Pequeña
Estero de
San Ramon
P. San Ramon
Boca de San Andres
Boca de San Rafael
Boca de Las Animas
Boca de Santo Domingo
Boca

GULF OF CA
CANAL BALLENAS
Puerto Refugio
I. ANGEL DE LA GUARDA
TIBURON
I. SAN ESTEBAN
I. SALSIPUEDAS
SAN LORENZO
B. Remedios
B. Angeles
B. Las Animas
Llanos de Santa Ana
Llanos del Principio
Yubay
Laguna Seca de San Julian
San Francisco de Borja
Paraiso
Rancho Viejo
Santa Ana
Llanos de Santa Maria
Laroque
San Sebastian
San Luis
Calmalli
Campo Aleman
Sto. Domingo
Manuela Lagoon
Black Warrior
Llanos de
Cerrendo
El Cardon Grande
Arr. del Cerro
Sta. Gertrudis
Arr. San Pablo
San Pablo
Arr. Ascension
Arr. San Esteban
Santa Maria
Ascencion
San Esteban
SIERRA DE SAN FRANCISCO
NATIVIDAD
PI. SANTIAGO
CER. COLORADO
LAS TRES VIRGENES
VOLCAN
STA. MARIA
B. San Rafael
P. San Francisquito
B. San Francisquito
B. Santa Teresa
Cabo San Miguel
B. San Juan Bautista
B. San Carlos
P. Trinidad
B. Santa Ana
San Ignacio
S. Ignacio
Santa Brigida
San Joaquin
San Hilario
Arr. del Infierno
Minas de Sta. Rosalia
P. Sta. Agueda
I. TORTUGA
I. SAN MARCOS
Arr. Patrocinio
Patrocinio
LA TRINIDAD
SAN PEDRO
PURO AÑO
LAS PALMAS
Las Vacas
Dolores
Arr. San Juan
Del Valle
P. Clavada
P. Santa Inés
B. Santa Inés
Sta. Rosalia de Mulejé
P. Aguja
P. Concepcion
B. Concepcion
P. Colorada
P. Sta. Teresa
B. San Nicolas
P. Pulpito
B. San Basilio
P. San Basilio
P. Mercenarios
P. Mangles
San Bruno
Tierra Firma
P. Nopolo
P. Tintorera
Loreto
Comondu Viejo
Purisima
San Jose de Comondu
San Juanico
Sta. Pequeña
B. Pequeña
TRES HERMANAS
Estero de San Ramon
P. San Ramon
Boca de Pabellon
Salinas
de San Andres
de San Rafael
Las Animas
San Jorge
La Tinaja
Médano Blanco
Domingo
Las Palmas
San Javier
Sta. Rosalia

MAP OF
BAJA CALIFORNIA

Compiled by

GUSTAV EISEN

AFTER U. S. GOVERNMENT CHARTS

THE INTERIOR AFTER ORIGINAL EXPLORATIONS AND SURVEYS.

C A L I F O R N I A
B. Pequeña
Estero de
San Ramon
Salinas
Boca de
Pabellon
San Andrés
San Rafael
San Jorge
P.Sta.Teresa
B.San Nicolas
P.Pulpito
B.San Basilio
P.San Basilio
P.Mercenarios
P.Mangles
San Bruno
Comondu Viejo
San Jose de Comondu
LOS ENCINOS
LA GIGANTA
AGUA VERDE
Loreto
Tierra Firma
I.CORONADOS
P.Nopolo
P.Tintorea
P.Lobos
I.CARMEN
P.Perico
San Francisco Xavier
Medano Blanco
San Buenaventura
Sto.Domingo
San Bernardo
San Lucas
San Rafael
Posa Miguel
I.MONTSERRATE
P.San Cosme
B.Agua Verde
ISLA LA CATALANA
P.San Marcial
P.Sta.Maria
SAN MARCIAL
Sau Ramon
LA CAFETERA
Timbabiche
El Quepo
Jesus Maria
La Laguna
P.San Carlos
ROCA NEGRA
LA MORENA
I.STA.CRUZ
B.Dolores
I.SAN DIEGUITO
La Virgin de los Dolores
San Francisco
Llanos de Yrais
Frijol
San Luis
El Platano
SIERRA MECHUDO
LAS ANIMAS
I.SAN JOSÉ
I.SAN FRANCISCO
Cabeza de Mechudo
La Salada
CERRO DE LOS LIEBRES
Agua Colorada
Guadalupe
La Junta
Arr. de San Hilario
Guadalupe
CERRO COLORADO
Mesa de la Vieja
P.Coyote
I.PARTIDA
I.ESPIRITU SANTO
Canal San Lorenzo
B. LA PAZ
Los Reyes
P.Coyote
Rodriguez
Quelele
Arizpe
La Paz
B.Rosarito
I.CERALBO
P.del Marquis
Conejo
San Pedro
B. Ventana
P.Arena de la Ventana
B.Muertos
El Saltito
Carrizal
Palmarito
Todos Santos
P.Lobos
P.San Pedro
San Antonio
P.Pescaderos
Ensenada de la Palma
B.Palmas
Buena Vista
PORFIRIO DIAZ
SAN RAFAEL
B.Pescadero
P.Caparino
El Palmar
Boca de San Jacinto
P.La Tinaja
P.Cerro de la Playa
P.San Cristobal
Santiago
Miraflores
P Arena del Sur
C.Pulmo
El Salado
Santa Anita
San José del Cabo
P.Gorda
B.San Jose
C.Falso
C.San Lucas
Cabeza Ballena
P.La Palmilla
110
109